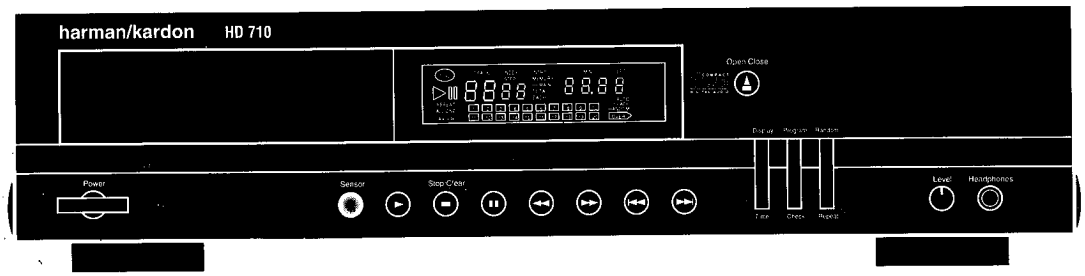
The Harman Kardon
Model *HD710*
COMPACT DISC PLAYER

Manual A

MODEL HD 710

Technical Manual



The following marks found in the parts list of this manual identify the models as follows :

HD710 (BK) : North America area model Black version
HD710 (B) : International model Black version
HD710 (1) : International model

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harman/kardon
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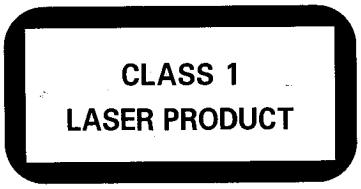
80 Crossways Park West, Woodbury, N.Y. 11797
1112-HD710 1295, 600 Printed in KOREA.

CLASS 1 LASER PRODUCT
Product complies with DHHS rules CFR subchapter J part 1040 : 10 at date of manufacture.

DANGER—Invisible laser radiation when opened and interlock filed or defeated. Avoid direct exposure to the beam.

CAUTION—use of all controls, adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.



Be Careful of the Laser Pickup
Although you cannot see it from the outside, a laser pickup is located under the disc tray and a precision lens is built in it. Since the laser pickup, including the lens element, is especially sensitive to dust, keep the disc tray closed when not in use. Also do not put your hand inside the unit.

ADVARSEL :
Usynlig laserstråling ved åbning når sikkerhedsafbrydere er ude at funktion. Undgå udsaettelse for stråling.

VAROITUS!
Laite sisältää laserdiodin, joka lähettää näkymätöntä silmille vaarallista lasersäteilyä.

SPECIFICATIONS

System	: Compact disc Digital Audio
D/A Converter	: Linear, Pulse Width Modulated 3D Bit Stream Clock Rate : 33.8688MHz, 18Bit/4Fs Digital Filter
Signal Detection	: 3-Beam Semiconductor Optical Laser Pickup
Error Correction	: CIRC System
Low Level Linearity	: +/-1.0db @-90dB
Frequency Response	: 8Hz to 20kHz +0dB/-1.5dB
Total Harmonic Distortion(THD)	: 0.004%
Dynamic Range	: 95dB
Signal to Noise Ratio	: 100dB
Channel Separation	: 93dB
Line Output Level/Impedance	: 2.0V @10kΩ
Digital Output Level/Impedance (Coaxial)	: 0.5Vp-p @75Ω
Power Supply	
U.S.A. and Canada models	: AC120V, 60Hz
International model	: AC230V, 50Hz
Power Consumption	: 12Watts
Dimensions(W×H×D)	: 17-5/16″×3-3/4″×13″ 440㎜×95㎜×330㎜
Weight	: 10.1lbs/4.6㎏

Specifications and components subject to change without notice. Overall performance will be maintained or improved.

SAFETY PRECAUTIONS

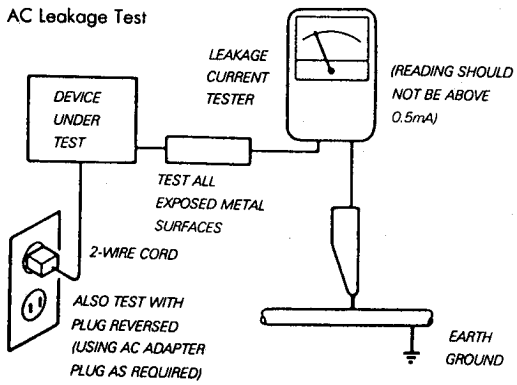
Before returning an Instrument to the customer, always make a safety check of the entire instrument, including, but not limited to, the following items :

a. Be sure that no built-in protective devices are defective and/or have been defeated during servicing.
   (1) Protective shields are provided to protect both the technician and the customer. Correctly replace all missing protective shields, including any removed for servicing convenience.
   (2) When reinstalling the chassis and/or other assembly in the cabinet, be sure to put back in place all protective devices, including, but not limited to, nonmetallic control knobs, insulating fishpaper, adjustment and compartment covers/shields and isolation resistor/capacitor networks.

   Do not operate this instrument or permit it to be operated without all protective devices correctly installed and functioning.

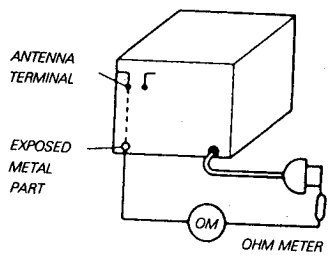
b. Be sure that there are no cabinet openings through which an adult or child might be able to insert their fingers and contact a hazardous voltage. Such openings include, but are not limited to excessively wide cabinet ventilation slots, and an improperly fitted and/or incorrectly secured cabinet back cover.

c. **Leakage Current Hot Check** – With the instrument completely reassembled, plug the AC line cord directly into a 120V AC outlet. (Do not use an isolation transformer during this test.) Use a leakage current tester or a metering system that complies with American National Standards Institute(ANSI) C101.1 "Leakage Current for Appliances" and Underwriters Laboratories (UL) 1270, (34.6). With the instrument AC switch first in the ON position and then in the OFF position, measure from a known earth ground (metal waterpipe, conduit, etc.) to all exposed metal parts of the instrument(antennas, handle bracket, metal cabinet, screwheads, metallic overlays, control shafts, etc.), especially any exposed metal parts that offer an electrical return path to the chassis. any current measured must not exceed 0.5 milliamp. Reverse the instrument power cord plug in the outlet and repeat test. **ANY MEASUREMENTS NOT WITHIN THE LIMITS SPECIFIED HEREIN INDICATE A POTENTIAL SHOCK HAZARD THAT MUST BE ELIMINATED BEFORE RETURNING THE INSTRUMENT TO THE CUSTOMER.**


AC Leakage Test
LEAKAGE CURRENT TESTER
(READING SHOULD NOT BE ABOVE 0.5mA)
DEVICE UNDER TEST
TEST ALL EXPOSED METAL SURFACES
2-WIRE CORD
ALSO TEST WITH PLUG REVERSED (USING AC ADAPTER PLUG AS REQUIRED)
EARTH GROUND

d. **Insulation Resistance Test**
   (1) Unplug the power supply cord and connect a jumper wire between the two prongs of the plug.
   (2) Turn on the power switch of the instrument.
   (3) Measure the resistance with an ohmmeter between the jumpered AC plug and each **exposed metallic** cabinet part on the instrument, such as screwheads, antenna, control shafts, handle brackets, etc. The reading should be as shown below. If it is not within the limits specified, there is the possibility of a shock hazard, and the instrument must be repaired and rechecked before it is returned to the customer.

e. **Insulation Resistance Test Cold Check**
   (1) Unplug the power supply cord and connect a jumper wire between the two prongs of the plug.
   (2) Turn on the power switch of the instrument.
   (3) Measure the resistance with an ohmmeter between the jumpered AC plug and each **exposed metallic** cabinet part on the instrument, such as screwheads, antenna, control shafts, handle brackets, etc. **When** the exposed metallic part has a return path to the chassis, the reading should be between 1 and 5. 2 Megohm. **When** there is no return path to the chassis, the reading must be "infinite". If it is not within the limits specified, there is the possibility of a shock hazard, and the instrument must be repaired and rechecked before it is returned to the **customer.**



PRODUCT SAFETY NOTICE

Some electrical and mechanical parts have special sefety related characteristics which are often not evident from visual inspection, nor can the protection they give necessarily be obtained by replacing them with components rated for higher voltage, wattage, etc. Parts that have special safety characteristics are identified by shading, by (⚠) on schematics and parts listed. Use of a substitute replacement that does not have the same safety characteristics as the recommended replacement part might create shock, fire, and/or other hazards. Products Safety is under review continuously and new instructions are issued whenever appropriate.

SERVICING PRECAUTIONS

CAUTION : Before servicing instruments covered by this manual and its supplements, read and follow the SAFETY PRECAUTIONS on this page.

NOTE : If unforeseen circumstances created conflict between the following servicing precautions and any of the safety precautions, always follow the safety precautions

Remember : Safety First

General Service Precautions

a. Always unplug the instrument AC Power cord from the AC power source before :
   (1) Removing or reinstalling any component, circuit board, module, or any other instrument assembly.
   (2) Disconnecting or reconnecting any instrument electrical plug or other electrical connection.
   (3) Connecting a test substitute in parallel with an electrolytic capacitor in the instrument.
   Caution : A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.

b. Do **not** defeat any plug/socket B+ voltage interlocks with which instruments covered by this manual might be equipped.

c. Do **not** apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.

d. Always connect a test instrument's ground lead to the instrument chassis ground before connecting the test instrument positive lead. Always remove the test instrument ground lead last.

NOTE : Refer to Safety Precautions on page 3.

(1) The service precautions are indicated or printed on the cabinet, chassis or components. When servicing, follow the printed or indicated service precautions and service materials.

(2) The Components used in the unit have a specified conflammability and dielectric strength. When replacing any components, use components which has the same ratings. Components marked ⚠) in the circuit diagram are important for safety or for the characteristics of the unit. Always replace with the appointed components.

(3) An insulation tube or tape is sometimes used and some components are raised above the printed wiring board for safety. The internal wiring is sometimes clamped to prevent contact with heating components. Install them as they were.

(4) After servicing, always check that the removed screws, components and wiring have been installed correctly and that the portion around the service part have not been damaged and so on. Further check the insulation between the blades of attachment plug and accessible conductive parts.

Insulation Checking Procedure

Disconnect the attachment plug from the AC outlet and turn the power on. Connect the insulation resistance meter (500V) to the blades of the attachment plug. The insulation resistance between the each blade of the attachment plug and accessible conductive parts (Note 1) should be more than 1M-ohm.

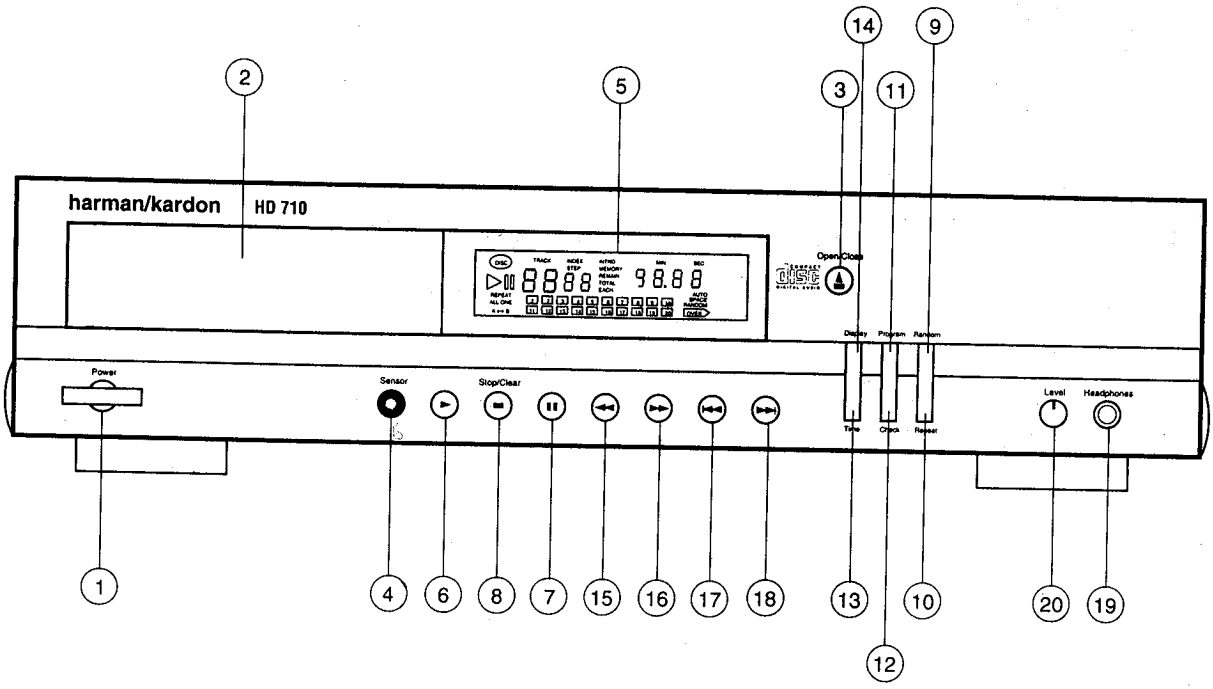
Note 1 : Accessible Conductive Parts including Metal panels, Output jacks, etc.

ELECTROSTATICALLY SENSITIVE (ES) DEVICES

Some semiconductor (solid state) devices can be damaged easily by static electricity. Such components commonly are called electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed for potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charge sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device wil be installed.
   CAUTION : Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device).

CONTROLS AND FUNCTIONS



1. POWER SWITCH

The POWER switch turns the unit on and off.

2. COMPACT DISC DRAWER

Load a disc (full-size or 3-inch/8cm) into your compact disc player by placing it in this drawer with the label side up. Open and close the drawer using the OPEN/CLOSE button (3).

3. OPEN/CLOSE BUTTON (▲)

Press this button to open or close the compact disc drawer. The drawer will also close if you press the play button or push the drawer gently toward the chassis of the player; however, we recommend that you do not push the drawer.

4. REMOTE SENSOR

This area receives the signal from the remote control unit. Make sure this area of the front panel is kept free from dirt or other obstructions that might prevent proper reception of the infrared signal from the remote control.

5. MULTI-FUNCTION DISPLAY

This display shows the corresponding information according to each mode.

6. PLAY BUTTON (►)

This button is used for starting play.

7. PAUSE BUTTON (II)

This button is used for holding play at the start of a track or interrupting play.

8. STOP/CLEAR BUTTON (■)

This button is used for stopping play or clearing programmed tracks.

9. RANDOM PLAY BUTTON

This button is used for playing the tracks on a disc in random order.

10. REPEAT BUTTON

This button is used for repeating one track or all tracks.

11. PROGRAM BUTTON
This button is used for storing the tracks in the Program mode.

12. PROGRAM/CHECK BUTTON
This button is used for checking the stored tracks.

13. TIME BUTTON
This button is used for checking the elapsed playing time from the beginning of current track or remaining playing time of current track or remaining playing time of disc.

14. DISPLAY BUTTON
This button is used to dim the display lighting, if desired.

15. BACKWARD SEARCH BUTTON (◄◄)
This button is used for searching for a particular passage in fast reverse.

16. FORWARD SEARCH BUTTON (►►)
This button is used for searching for a particular passage in fast forward.

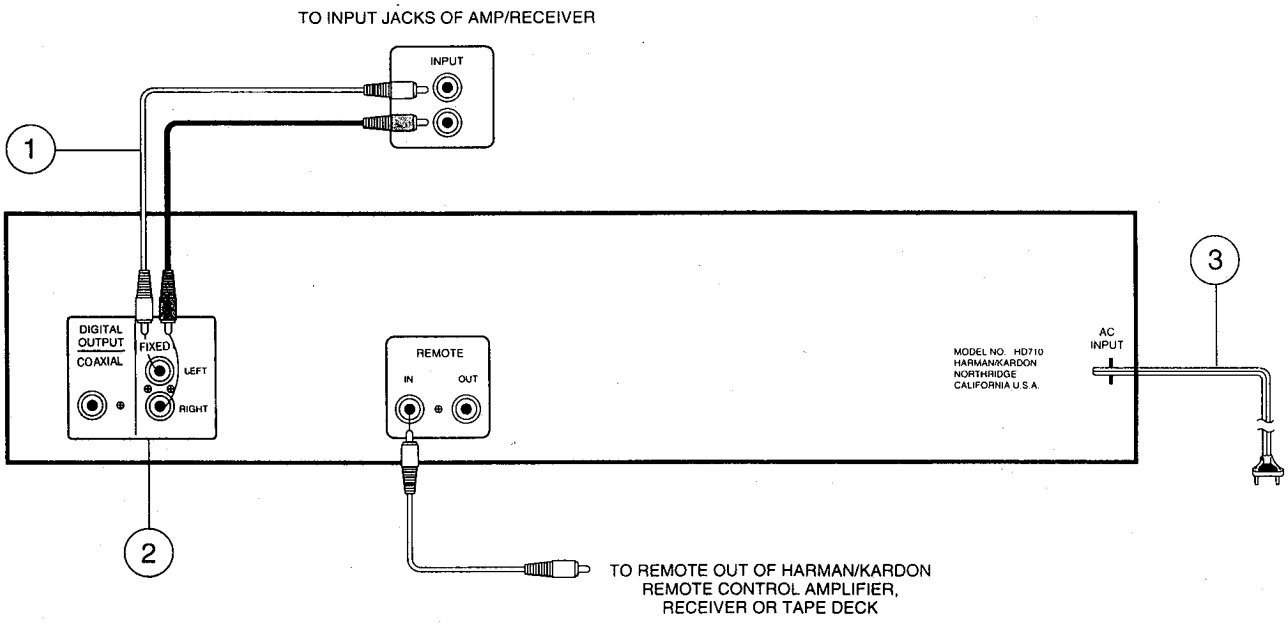
17. BACKWARD SKIP BUTTON (|◄◄)
This button is used for replaying from the beginning of the current track or returning to a previous track.

18. FORWARD SKIP BUTTON (►►|)
This button is used for moving onto the next track.

19. HEADPHONE JACK
This jack is used for listening with headphones.

20. HEADPHONE VOLUME
This is used for the adjustment of the headphone listening level.

REAR PANEL CONNECTIONS



- Before you begin to connect this unit to your system, be sure that all components are turned off and unplugged from the electrical outlet.
- See the connection diagram in the operating instruction manual of a Harman/Kardon compatible amplifier or receiver/preamplifier/integrated.

1. CONNECTION CORDS

On the back of your HD710 are output jacks that connect your CD player to your receiver, integrated amplifier, or preamplifier. Using the supplied shielded cords, connect the left and right output jacks on the back of the CD player to the left and right input jacks marked CD or AUX on the back of your receiver/preamplifier/integrated amplifier. Alternatively, you can also use the TAPE INPUT or TAPE PLAY jacks on your receiver/preamplifier /integrated amplifier.

Note : NEVER connect your CD player to the PHONO inputs.

2. OPTIONAL DIGITAL CONNECTION

The HD710 also has a digital output jack —a single electrical RCA-type connector. If your preamplifier has a digital-to-analog decoder and can accept a digital signal from a compact disc player, you can connect your CD player to your preamplifier using this digital jack.
Please note that using the digital output will bypass the internal D/A conversion circuitry and therefore miss one of the major benefits of this machine. The best use of this output is for direct connection to a digital recorder, a very high performance external D/A Converter, or a true Digital Signal Processing (DSP) Preamplifier.

3. AC INPUT CORD

Plug this cord into the AC outlet of an amplifier or receiver or a household AC outlet.

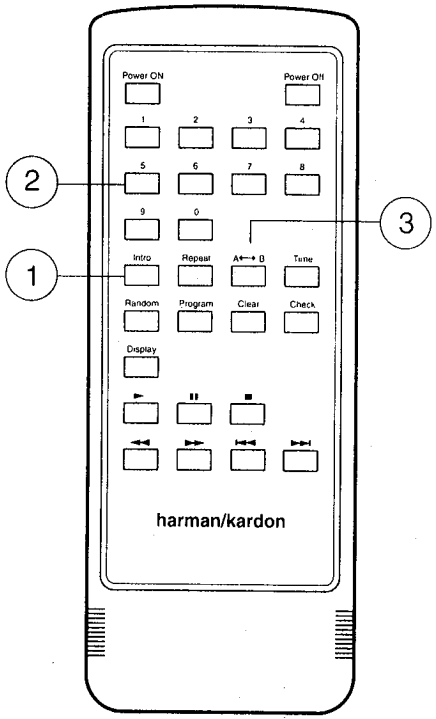
REMOTE CONTROL

The remote control for the HD710 provides the same functions found on the front panel of the compact disc player itself. In addition, the remote control provides some functions that are not found on the front panel.

The functions found on the remote control that are not found on the front panel are INTRO. A⇄B. and the 1-10 keys. These three functions are described below (for other functions. see the descriptions on page 5&6.)

1. INTRO BUTTON

This button puts your compact disc player in and out of INTRO SCAN mode. When INTRO SCAN is on and you press PLAY, the unit plays only the first 15 seconds of each track before moving on to the next. Press the button once to turn on INTRO SCAN mode;press again to turn it off and stop the scanning. When the unit is in INTRO SCAN mode, the FUNCTION indicator (5) will display the word INTRO.



2. NUMERIC BUTTONS(0-9)

- If you press the number that corresponds to your desired track with the NUMERIC buttons, the unit plays that track immediately without the PLAY button.
- **To select a two digit track number the second digit must be pressed within about 2 seconds after the first digit has been pressed.**
- During programming, if you select the desired track with the NUMERIC buttons, that track is programmed without the PROGRAM button.

3. A⇄B BUTTON

- Press the A⇄B BUTTON at the beginning of the passage you want, then REPEAT appears on the display and [A⇔] Blinks.
- Press this button again at the end of the passage, then [A⇔] [B] appears on the display and the specific passage is
- If you want to cancel repeat A⇄B play, press the A⇄B or STOP/CLEAR button.

HD710 REMOTE CONTROL OPERATION

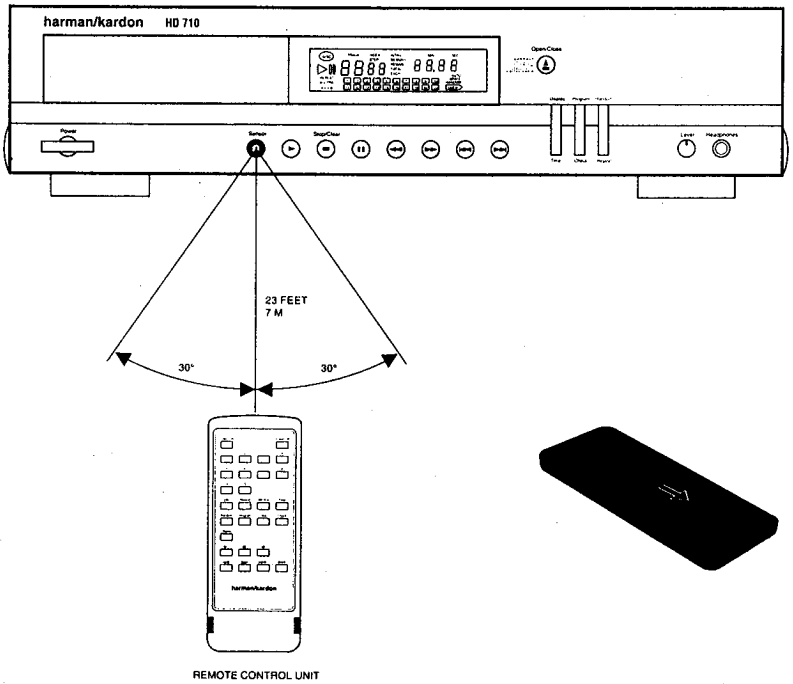
The remote control operates within a 30° angle and 23ft. (7m) range of the remote sensor on the front panel of the unit. Make sure that the remote's front projection "lens" as well as the REMOTE SENSOR area on the front panel of the unit are kept free from dirt to ensure proper transmission and reception of the infrared beam. Also make sure that no objects (e.g., stereo cabinet doors, end tables) block the path from the remote control to the REMOTE SENSOR area.

Avoid using the remote control near fluorescent lamps, as they may shorten its operating range.

If your remote control will sit unused for a long period of time, remove the batteries to prevent damage from corrosion.

REAR PANEL REMOTE JACKS

The remote control input jack allows remote control of this unit via a cable. This cable can be connected to the remote control output jack of another Harman Kardon product. Alternatively, it can be connected to an accessory device that converts infrared remote control signals into detected pulses. While all Harman Kardon products with remote control jacks are compatible with one another, not all accessory devices or other manufactuer's products are. However, it is safe to experiment.



REMOTE CONTROL UNIT

CONCERNING USE OF BATTERIES

Two batteries are provided with your remote control. To load batteries:

1. **Locate the cover over the battery compartment on the back of the remote control. Remove the cover by sliding it in the direction of the embossed arrow.**
2. Insert the two AA (1.5V/R6/UM3) batteries. Make sure you insert the batteries according to the + and − polarity symbols at the bottom of the battery compartment.
3. Replace the cover of the battery compartment.

NOTE :

1. When you replace weak batteries, replace both at the same time.
2. Remove the batteries if the remote is not to be used for an extended period of time.
3. Do not use rechargeable batteries (Ni-Cd-type)

DISASSEMBLY PROCEDURES(REFER TO PAGES 52 THROUGH 54)

(1) CABINET TOP (18) REMOVAL

Remove 6 screws (E)(F) and then remove the Cabinet Top (18).

(2) FRONT PANEL ASS'Y (AA) REMOVAL

1. Remove the Cabinet Top (18), referring to the previous step (1)
2. Disconnect the connector with lead wire (WA501, WA502) from Connector (WA501, WA502) on the Main P.C. Board (PCB-1).
3. Open the lid of connector (CN601) on the Headphone P.C. Board (PCB-3) and then disconnect the jumper lead (JL406).
4. Remove 7 screws (B) and then remove the Front Panel Ass'y (AA) with the Front P.C. Board (PCB-2).
5. Remove 4 screws (13) and then remove the Front P.C. Board (PCB-2) from the Front Panel Ass'y (AA).

(3) MAIN P.C. BOARD (PCB-1) REMOVAL

1. Remove the Cabinet Top (18), referring to the previous step (1)
2. Remove 4 screws (C) and then remove the Main P.C. Board (PCB-1).

[4] CD PLAYER MECHANICAL ASSEMBLY (26) REMOVAL

2. Disconnect the connector with lead wires (WA302, WA303, WA304) from connectors(WA302, WA303, and WA304) on the Main P.C. Board (PCB-1)
3. Remove 3 screws (B) and then remove the CD Player Mechanical Assembly (26) backward.

[5] DISASSEMBLING THE CD PLAYER MECHANICAL ASSEMBLY DISC TRAY (See page 54) REMOVAL

1. Remove the Cabinet Top (18), referring to the previous step (1).
2. Connect the Power cord and turn on the power by pressing the Power switch.
3. Open the Disc Tray (6) by pressing the Open/Close button.
4. With the Disc Tray (6) opened as it is, pull out the power plug.
5. Push the Disc Tray (6) by hand to slide it in once.

[6] OPTICAL PICK-UP (16-1) REMOVAL

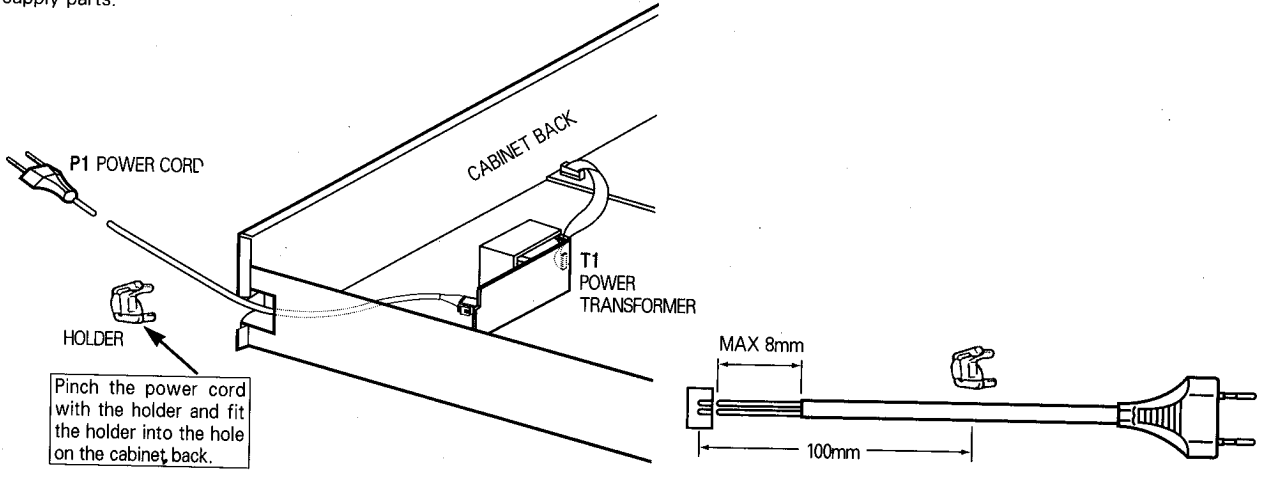
1. Remove the CD Player Mechanical Assembly (26), referring to the previous step (4).
2. Remove 4 screw (12) and then remove the Disc Motor Ass'Y (16) with Pick-up, Slide Motor and etc.
3. Remove the two Gears (16-4 and 16-6)
4. Remove the shaft (16-2) and then remove the pick-up (16-1).

[7] SLIDE MOTOR (16-8) REMOVAL

1. Remove the CD player Mechanical Ass'Y (26), referring to the previous step (4).
2. Unsolder the terminal of Disc and Slide Motors, then remove the Motor P.C. Board (16-10)
3. Remove the Slide Motor (16-8)

POWER CORD REPLACEMENT(FOR SERVICE ENGINEERS OTHER THAN NORTH AMERICA)

In order to prevent fire or shock hazard when replacing the power cord, follow the procedure below to replace the part with the standard supply parts.



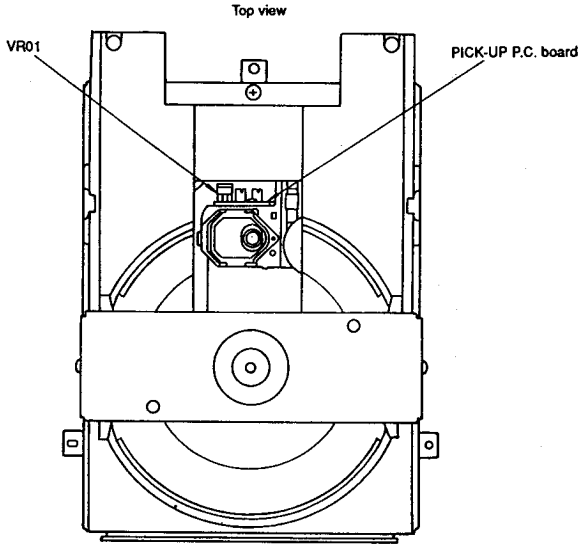
ADJUSTMENT PROCEDURE

1. Instruments required

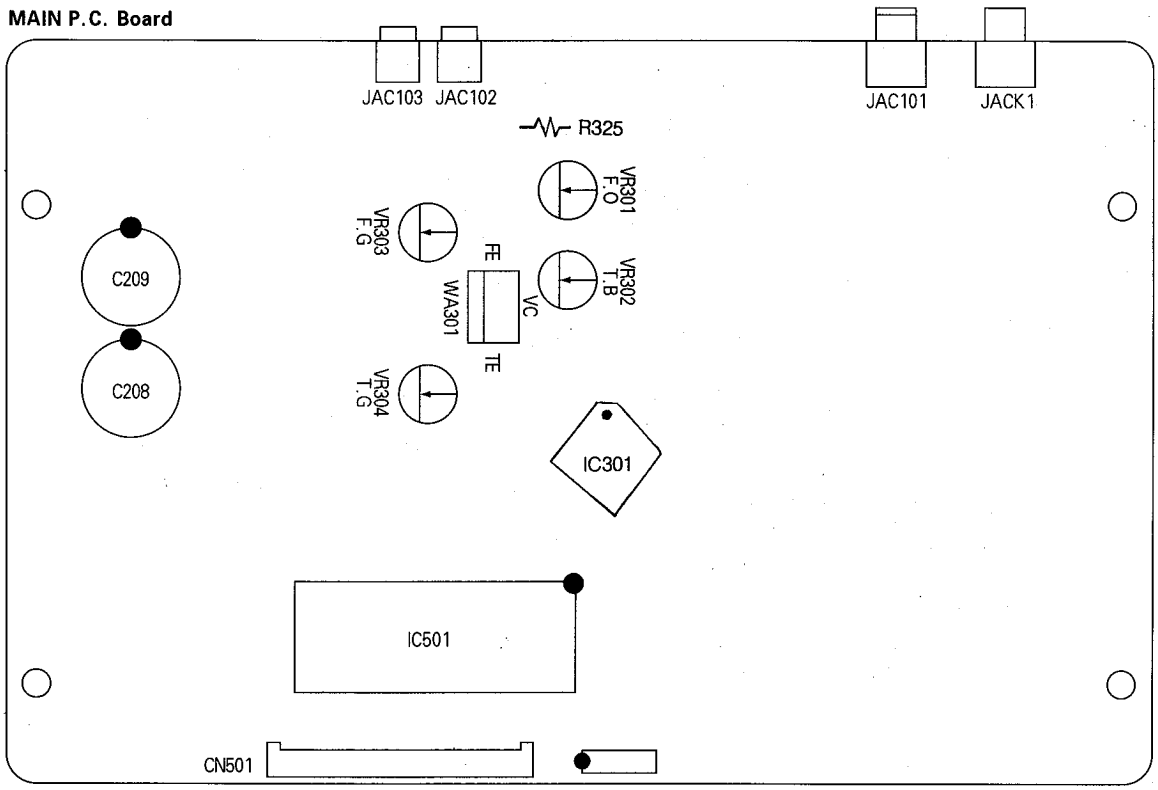
- DC voltmeter
- Oscilloscope (3 or more modes, 100MHz, input select DC range)
- Jitter meter
- Distortion meter
- Test disc : EIAJ CD-1/TCD-781

2. Adjustment points

2-1. Adjusting screw layout for CD player mechanical assembly.



2-2. VR and test point layout for main P.C. Board.

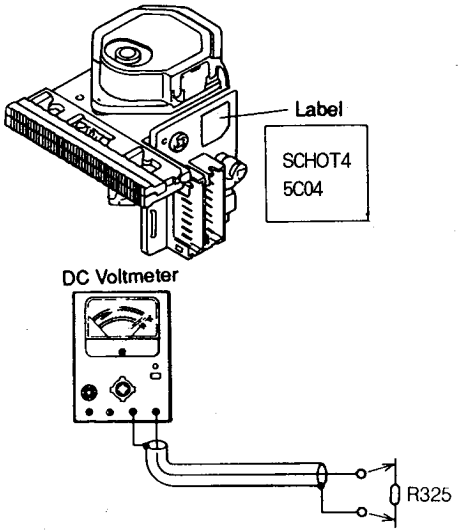


3. Optical Pick-up Laser Power Adjustment

The specified value for adjustment varies with the type of the pick-up in use. Obtain the voltage value according to the following procedure.

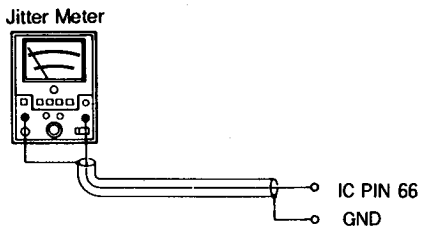
(a) Read the current value on the label of the pick-up P.C. board.
(b) Using the amperage of the current and the following equation, calculate the voltage value.
When the current is 39.9mA :
V=0.0399A×22=0.8878V

1) Connect the DC voltmeter to both ends of R325.
2) Insert EIAJ CD-1 test disc and place the unit in the Play mode.
(3) Adjust VR01 in the pick-up P.C. board to the voltage obtained in step (b) above.



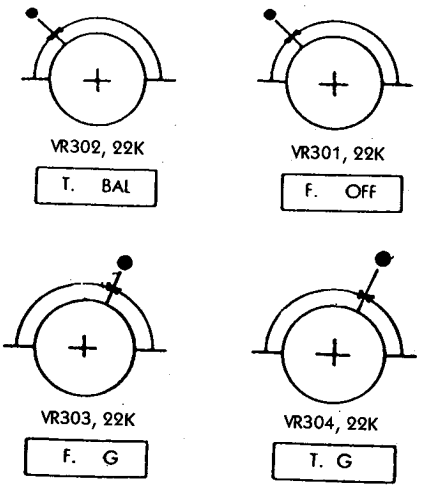
4. Jitter Inclination Confirmation

(1) Connect the jitter meter (sigma range) to IC301 PIN 66 and GND
(2) Insert EIAJ CD-1 test disc and place the unit in the Play mode.
(3) Confirm the jitter meter reading is less than 30ns.

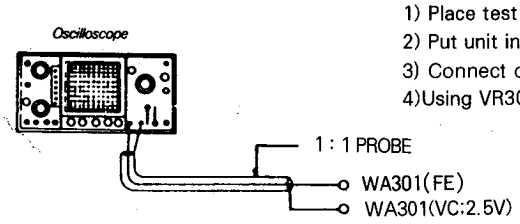


5. INITIAL SETTING OF ADJUSTMENT POTENTIOMETERS

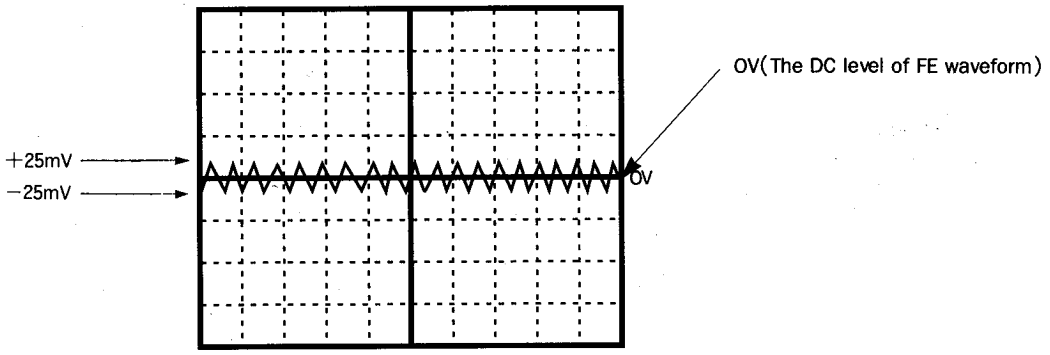
Before adjustment of step # 6, preset adjustment potentiometers as follows.



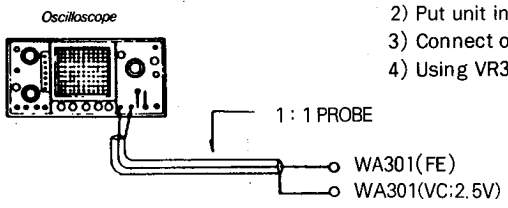
6. FOCUS OFFSET ADJUSTMENT



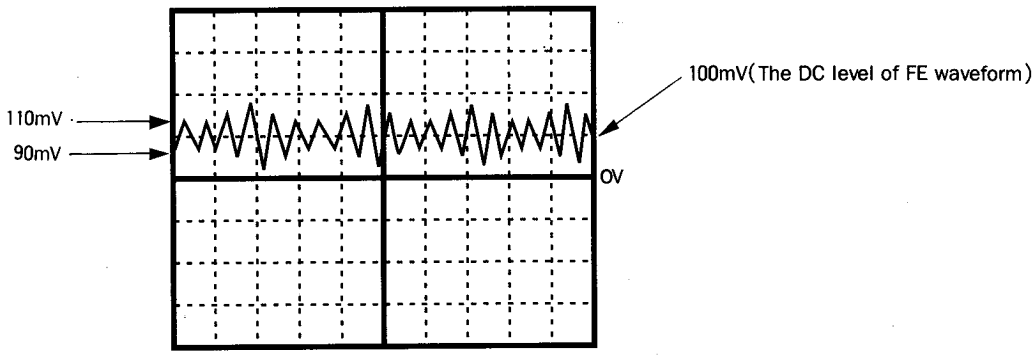
1) Place test disc on turntable.
2) Put unit into stop mode.
3) Connect oscilloscope to WA301(TE) and WA301(VC : 2.5V)
4)Using VR301, adjust the TE DC voltage in reference to VC to a value of 0±25mV.



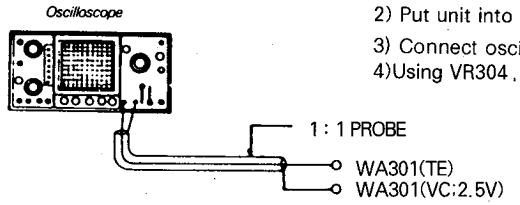
7. FOCUS GAIN ADJUSTMENT



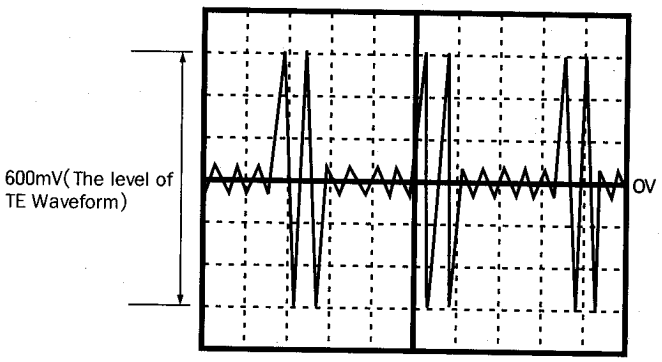
1) Place test disc on turntable.
2) Put unit into play mode.
3) Connect oscilloscope to WA301(FE) and WA301(VC : 2.5V)
4) Using VR303, adjust the TE DC voltage in reference to VC to a value of 100± 10mV.



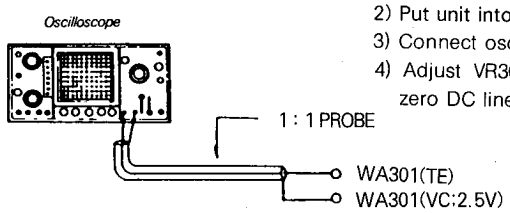
8. TRACKING GAIN ADJUSTMENT



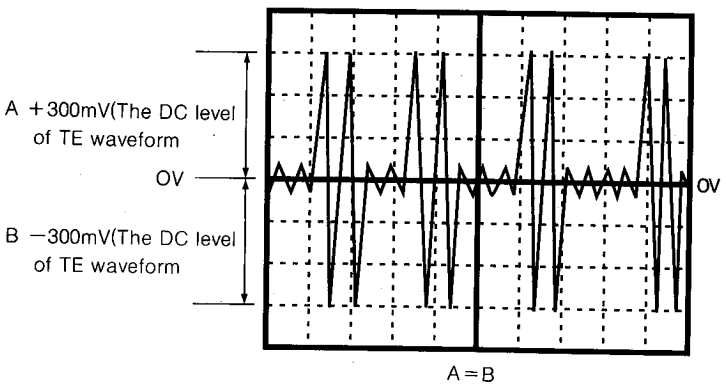
1) Place test disc on turntable.
2) Put unit into skip(or search) play mode.
3) Connect oscilloscope to WA301(FE) and WA301(VC : 2.5V)
4)Using VR304 , adjust the TE DC voltage in reference to VC to a value of 600±10mV.



9. TRACKING BALANCE ADJUSTMENT



1) Place test disc on turntable.
2) Put unit into skip(or search) play mode.
3) Connect oscilloscope to WA301(TE) and WA301(VC : 2.5V)
4) Adjust VR302 so that the amplitude above and below the zero DC line becomes equal. (Amplitude A = Amplitude B)



A = B

TROUBLESHOOTING GUIDE

NO LIGHTS ON THE FRONT PANEL

- Power cord is not plugged into power outlet
- Waii outlet or extension cord is faulty. Check for poor connections.
- Breaker on plug strip has tripped. Reset breaker.

FRONT PANEL LIGHTS ARE ON, BUT THE CD DOES NOT PLAY

- The disc may have been inserted upside down. Make sure the label side is facing up.
- Moisture may have formed on the laser/receptor inside the unit. This sometimes occars in damp climates or whon the anit is moved from a cold to a warm area. Leave the unit turned on at room temperature for 30 minutes to allow the moisture to evaporate, then play your disc.

THE PLAY INDICATOR LIGHTS, BUT NO SOUND IS HEARD

- The wrong SOURCE has been selected on your integrated amplifier/receiver/preamplifier. Make sure you have selected the SOURCE where your CD player is connected.

THE SOUND SKIPS OR STUTTERS DURING PLAYBACK

- The disc may be dirty or damaged.
- The unit may have been placed on an unstable surface. Isolate the unit from excessive vibration by placing it on a firmer surface or farther away from your speakers.

THE SOUND IS CONTINUOUSLY DISTORTED

- The cables from the HD710 have been plugged into the wrong input jacks on your integrated amplifier/receiver/ preamplifier. Make sure you have not plugged the unit into the PHONO jacks.

NOTHING HAPPENS WHEN FUNCTION KEYS ARE PRESSED

- Turn the power to the unit off, then back on again.

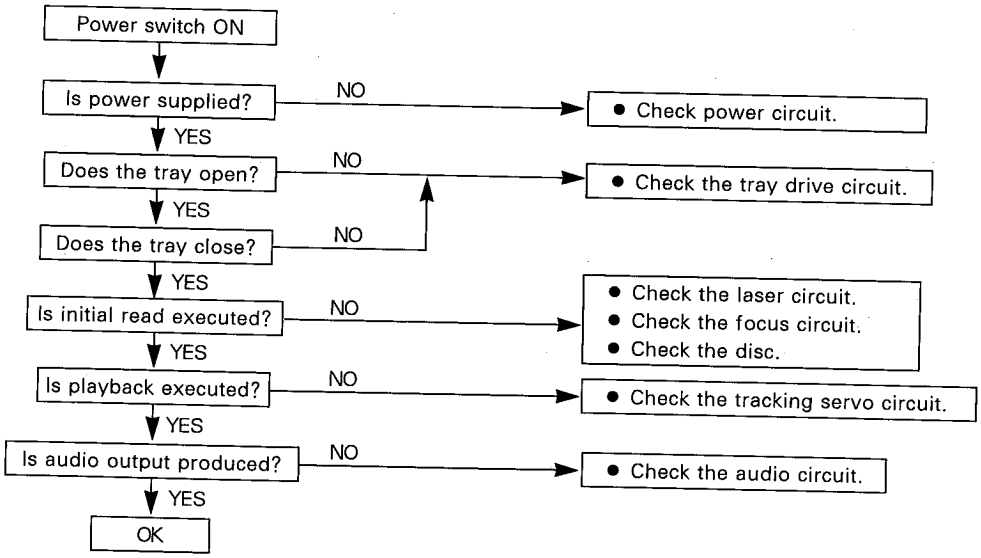
THE DISPLAY SHOWS BROKEN CHARACTERS

- Turn the power to the unit off, then back on again.

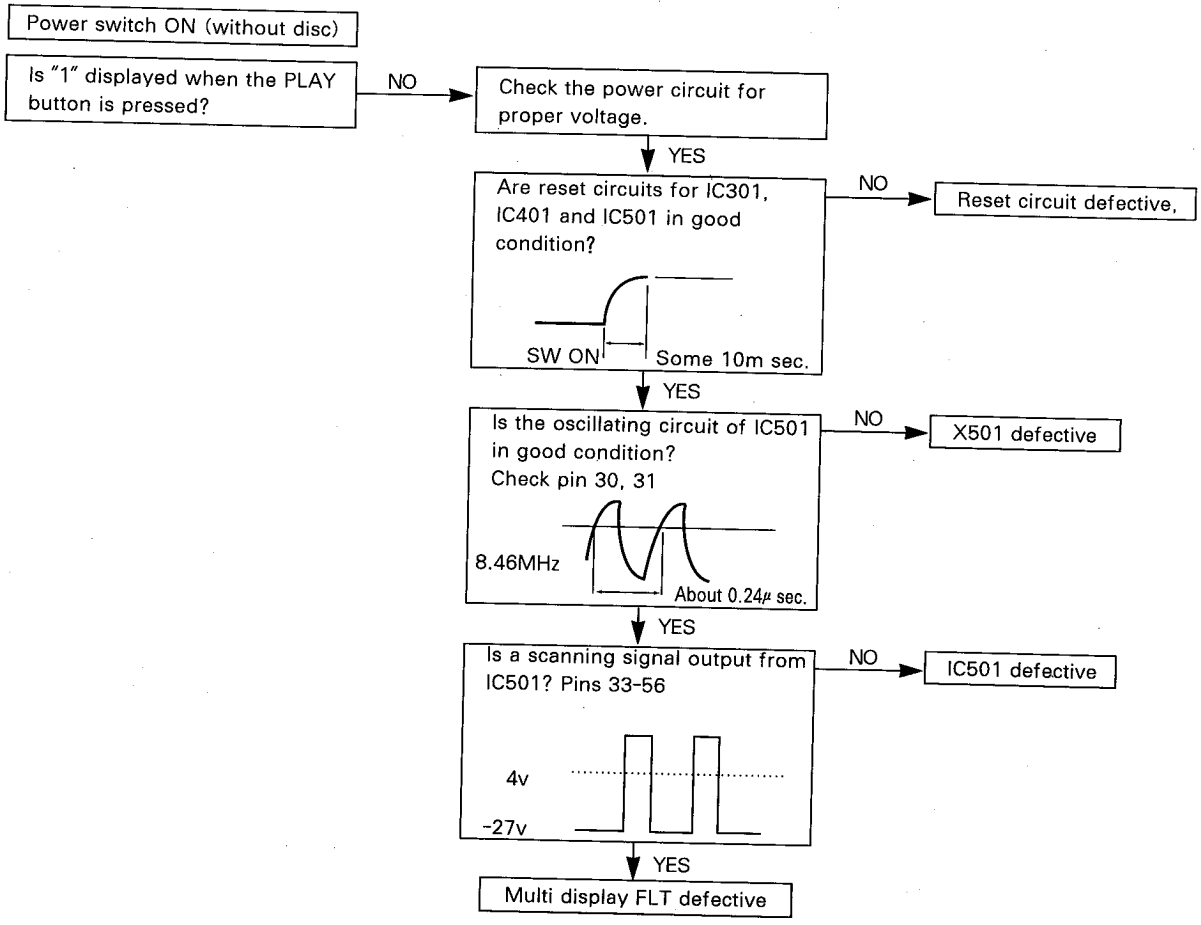
THE REMOTE CONTROL DOES NOT FUNCTION CORRECTLY

- Make sure you are using the remote control within the 30° angle and 23ft. (7m) range described in this manual.
- Make sure the remote transmitter lens and the front panel REMOTE SENSOR window are clean and that no objects are blocking the path from the remote control to the REMOTE SENSOR area on the front panel.
- Make sure that no strong fluorescent lights are being used in the listening room.
- Check that the batteries inside the remote control are fresh.

When a trouble has occurred. first check the pick-up lens for dirt and each connector for tight and secure connection. If the problem persists after checking both of these items. use the following check procedures.

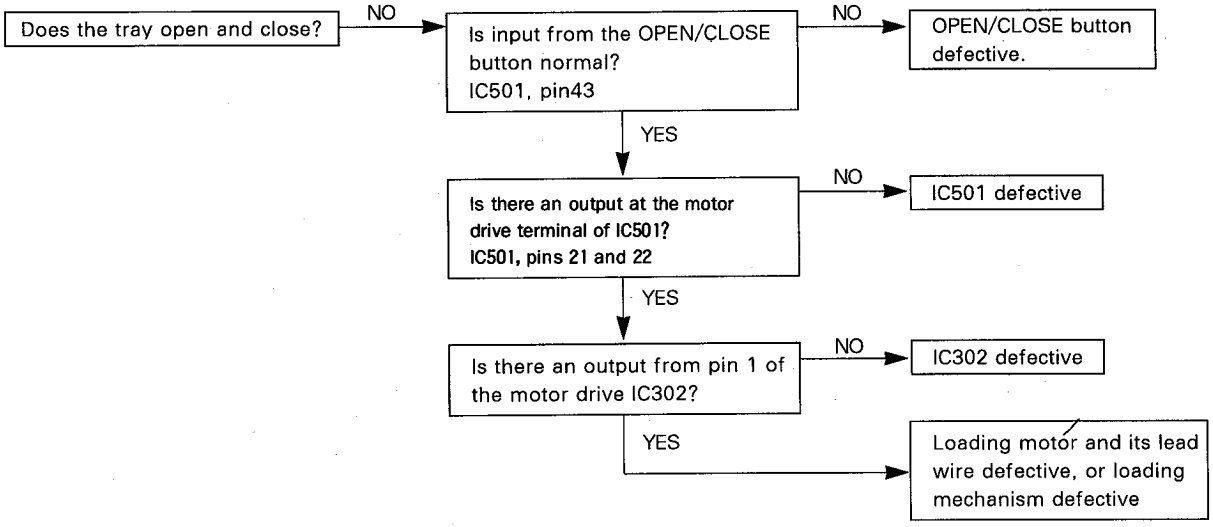


(1) When Multi Display fails to light properly.

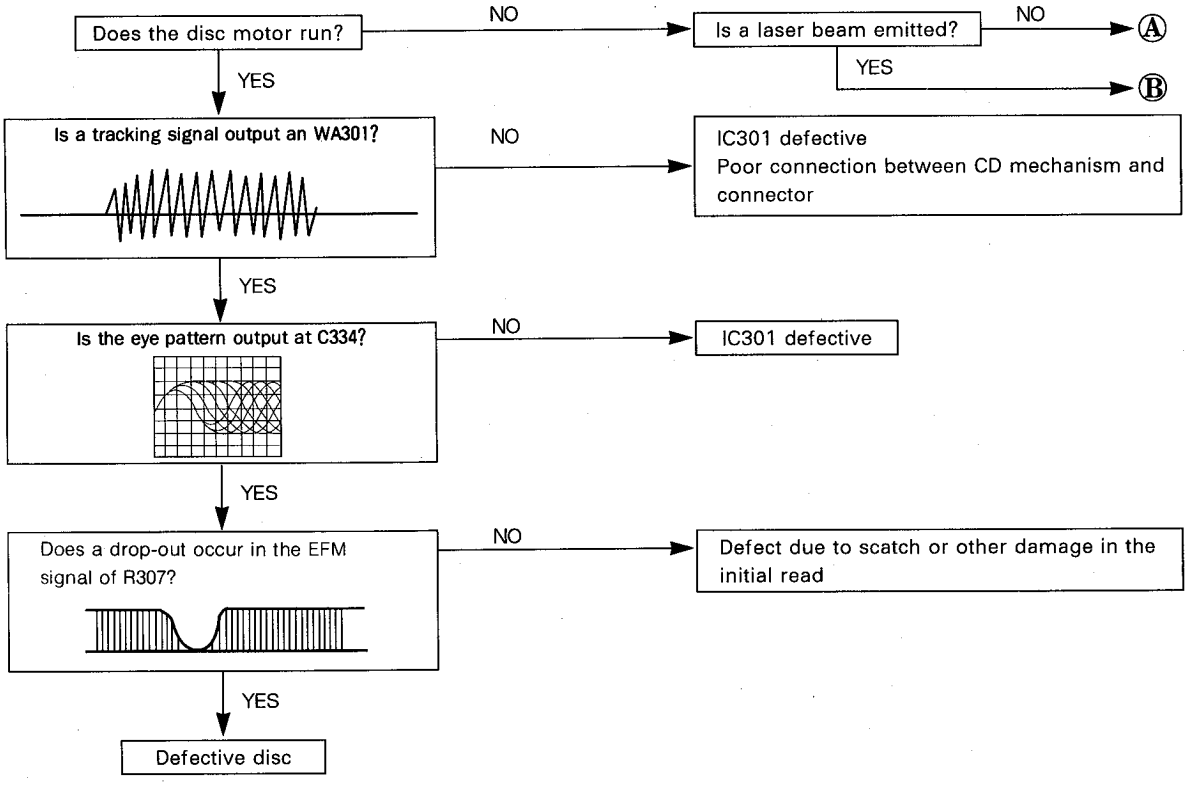


When a problem occurs, first check the pick-up lens for dirt and each connector for tight and secure connection. If the problem persists after checking both of these items, use the following check procedures.

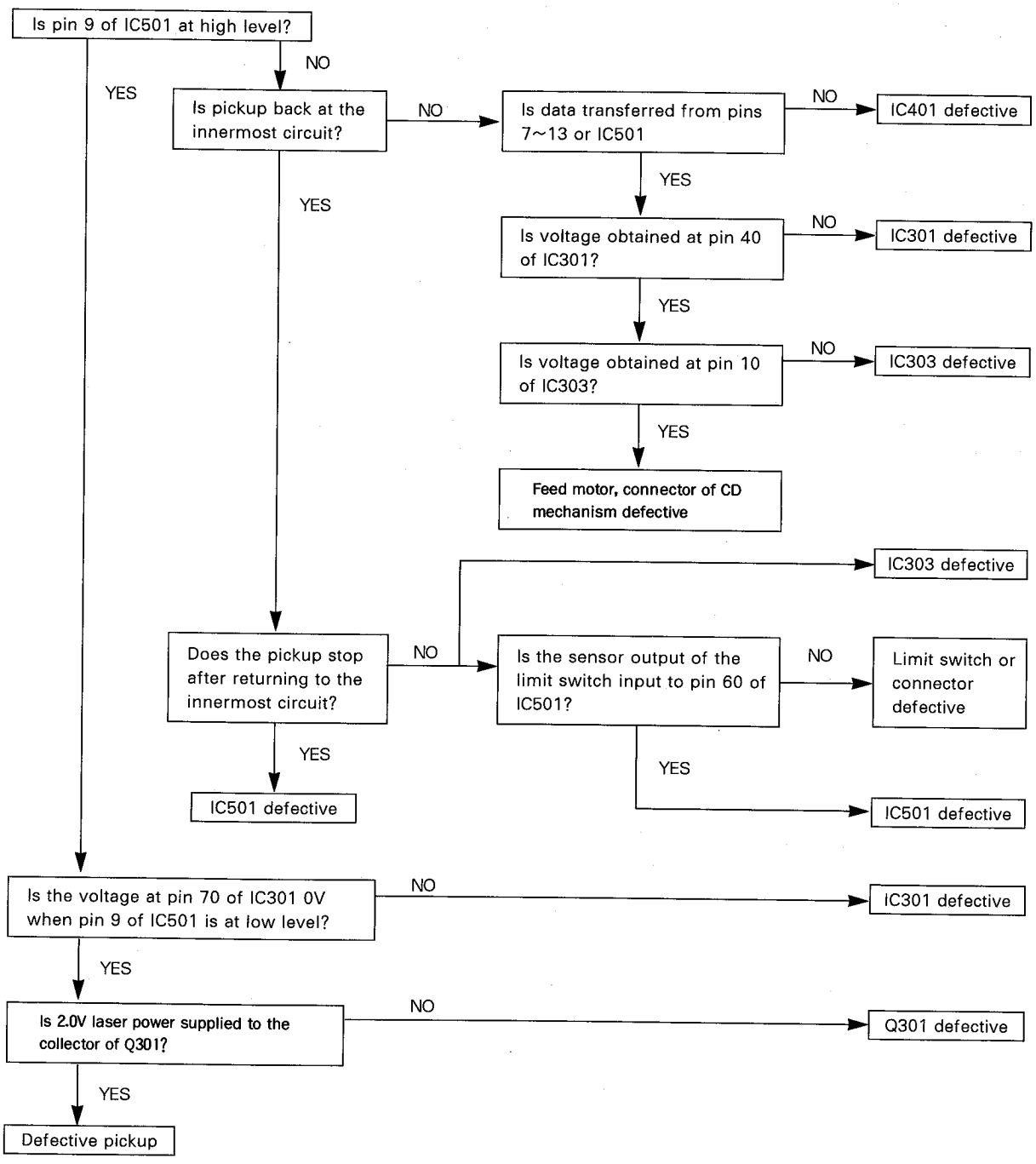
(2) When the tray fails to operate properly.


Does the tray open and close?
NO
Is input from the OPEN/CLOSE button normal? IC501, pin43
NO
OPEN/CLOSE button defective.
YES
Is there an output at the motor drive terminal of IC501? IC501, pins 21 and 22
NO
IC501 defective
YES
Is there an output from pin 1 of the motor drive IC302?
NO
IC302 defective
YES
Loading motor and its lead wire defective, or loading mechanism defective

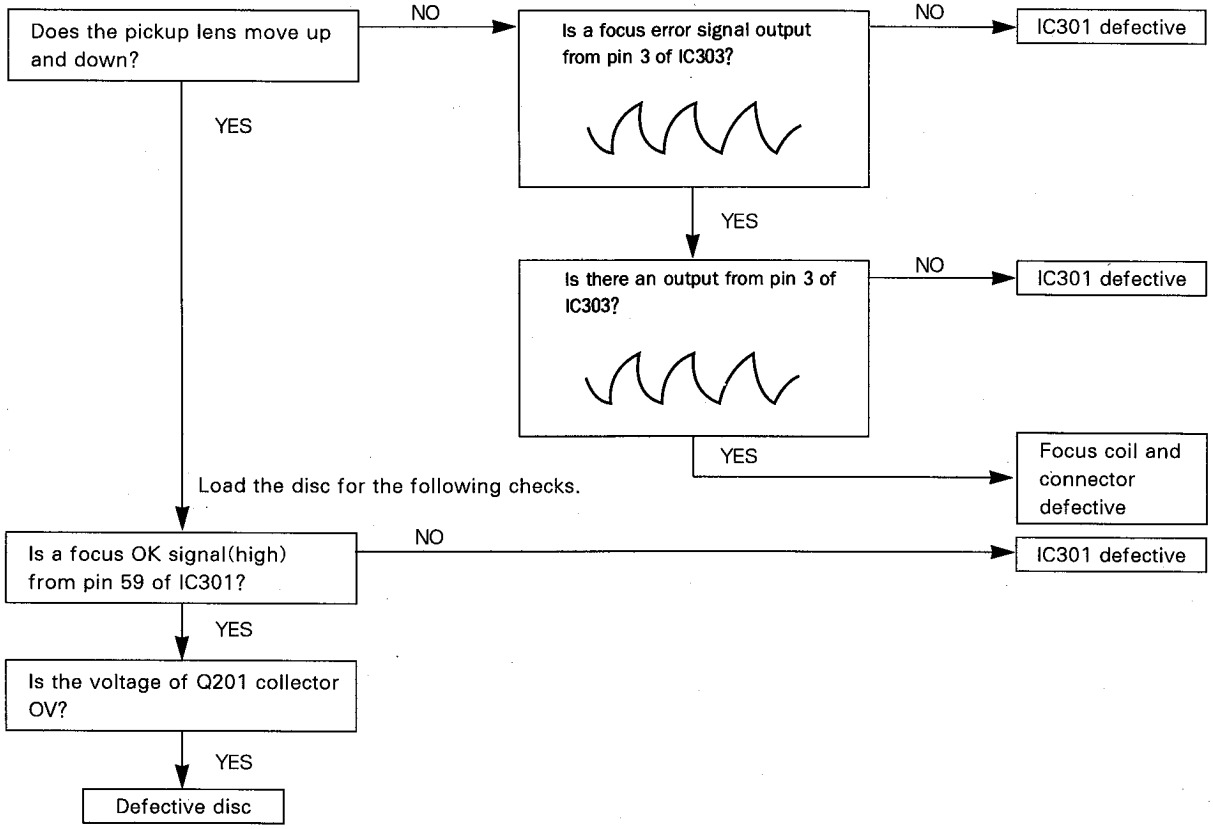
(3) When initial read cannot be executed.



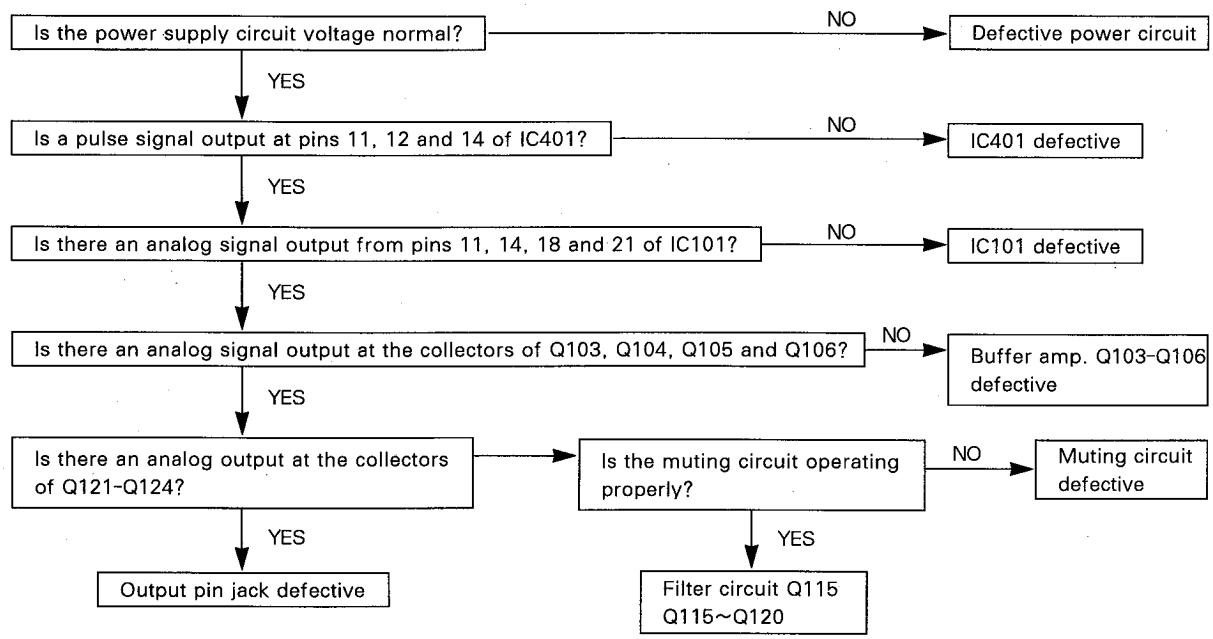
Ⓐ When laser beam is not emitted.



Ⓑ When laser beam is emitted.



When there is no audio output


Is the power supply circuit voltage normal?
NO
Defective power circuit
YES
Is a pulse signal output at pins 11, 12 and 14 of IC401?
NO
IC401 defective
YES
Is there an analog signal output from pins 11, 14, 18 and 21 of IC101?
NO
IC101 defective
YES
Is there an analog signal output at the collectors of Q103, Q104, Q105 and Q106?
NO
Buffer amp. Q103-Q106 defective
YES
Is there an analog output at the collectors of Q121-Q124?
Is the muting circuit operating properly?
NO
Muting circuit defective
YES
YES
Output pin jack defective
Filter circuit Q115 Q115~Q120

TERMINAL FUNCTIONS

IC(Number)	Pin no.	System	Description
IC301	1	AVEE (R)	Analog negative power supply input pin for RF part
	2	CPH	Capacitor connection pin of mirror hold
	3	CBH	Capacitor connection pin of defect bottom−hold
	4	TESTD	Defect test pin
	5	TESTM	Mirror test pin
	6	Test 1	Input pin for test
	7	PFSET	Peak frequency setting pin for focus, tracking compensation and fo (cut off frequency)of CLV LPF
	8	SSTOP	Check the position pin of pick−up whether inside or not
	9	DIRC	Direct 1 Track Jump Control Pin
	10	AVCC (S)	Analog positive power supply input pin for SERVO part
	11	WDCH	Auto−sequencer clock−input pin (Normal speed=88.2KHz, Double speed=176.4KHz)
	12	SMPD	Connection pin of DSP SMPD
	13	SMON	Connection pin of DSP SMPD, spindle servo ON at "H"
	14	N / C	No connection pin
	15	TGSW	Providing time constant to change the high frequency tracking gain
	16	RTG	Capacitor connection pin to switch the tracking gain of high frequency
	17	LFR	Capacitor connection pin to perform rising low bandwidth of focus servo loop
	18	FSW	High frequency gain of focus servo loop can be changed by FS3 switch ON or OFF
	19	HFGD	Reducing high frequency gain with capacitor connected between pin 18 and pin 19
	20	FSCH	Time constant external pin to generate focus search waveform
	21	VREGI	External regulator voltage input pin for VCO
	22	ISET	Determing the peak value of focus search, track jump and SLED kick
	23	VREG	3.5V Regulator output pin
	24	FVC	Pin connected external resistor to adjust free running frequency of VCO
	25	SMEF	Providing an external LPF time constant of CLV SERVO Loop
	26	BPF	Providing time constant for Loop filter of VCO
	27	MCK	Clock input pin from micom
	28	MLT	Latch input pin from micom
	29	MDAT	Data input pin from micom. reset at "L"
	30	RESET	Reset input pin from micom, reset at "L"
	31	LOCK	Pin for operation of the sled runaway prevention function at "L"
	32	TRCNT	Track count output pin
	33	ISTAT	Internal status output pin
	34	AVEE (S)	Analog negative power supply input pin for SERVO part
	35	APDI	Input pin of DSP phase comparison output (PHAS)
	36	F8M	Output pin of analog VCO Normal speed=8.64MHz, Double speed=17.28MHz
	37	AASC	Auto−Asymmetry control output pin
	38	EFMO	EFM comparator output pin
	39	SLEN	Non−inverting input pin of SLED SERVO amplifier
	40	SLEO	Output pin of SLED SERVO amplifier
	41	SLEI	Inverting input pin of SLED SERVO amplifier

	Pin no.	Symbol	Description
	42	TEST2	Test input pin to change speed mode Normal speed="H", Double speed="L"
	43	SPDI	Inverting input pin of spindle servo amplifier
	44	SPDLO	Spindle servo amplifier output pin
	45	FCE	Inverting input pin of focus servo amplifier
	46	FSEO	Output pin of focus servo amplifier
	47	TKEI	Non-inverting input pin of tracking servo amplifier
	48	TKEO	Output pin of tracking servo amplifier
	49	N/C	No connection
	50	ATS	Anti-shock input pin
	51	TZC	Tracking Zero Crossing input pin
	52	TE2	Tracking Error Servo input pin
	53	TE1	Output pin of tracking Error amplifier
	54	TDFCT	Capacitor Connection pin for Defect Compensation of tracking servo
	55	DVCC (S)	Digital positive power supply input pin for servo part
	56	FE2	Focus error servo input pin
	57	FE1	Output pin of focus error amplifier
IC301	58	FDFCT	Capacitor connection pin for defect compensation of focus servo
	59	FOK	Output pin of Focus ok comparator
	60	LDON	Laser diode ON/OFF control pin
	61	EI	Feedback input pin of EI-V amplifier
	62	E0	Output pin of EI-V amplifier
	63	FBIAS	Bias pin of non-inverting input of focus error amplifier
	64	DVEE (S)	Digital negative power supply input pin for servo part
	65	RFI	Output Signal of RF summing amplifier is inputed through capacitor
	66	RFO	Output pin of RF summing amplifier
	67	RF-	Inverting input pin of RF summing amplifier
	68	RV	Output pin of (AVCC+AVEE)/2 Voltage
	69	CV	Bias input pin of Center Voltage buffer
	70	LD	Output pin of APC amplifier
	71	PD	Input pin of APC amplifier
	72	AVCC (R)	Analog positive power suppiy input pin for RF part
	73	N/C	No connection
	74	PD2	Inverting input pin of RF I-V AMP2
	75	PD1	Inverting input pin of RF I-V AMP1
	76	F	Inverting input pin of F I-V AMP
	77	E	Inverting input pin of E I-V AMP
	78	P/N	Selecting P-sub/N-sub of Laser diode
	79	DCC2	Defect bottom-hold output is inputed through capacitor
	80	DCC1	Output pin of defect bottom-hold

IC	Pin no.	Symbol	I/O	Description
IC401	1	AVDD1		Analog Vcc1
	2	DPDO	O	Charge pump output for master PLL
	3	DPFIN	I	Filter input for master PLL
	4	DPFOUT	O	Filter output for master PLL
	5	CNTVOL	I	VCO control voltage for master PLL
	6	AVSS1		Analog Ground 1
	7	DATX	O	Digital audio output
	8	XIN	I	X-tal oscillator input
	9	XOUT	O	X-tal oscillator output
	10	WDCH	O	Word clock of 48 bit/SLOT (Normal speed=88.2KHz, Double speed=176.4KHz)
	11	LRCH	O	Channel clock of 48 bit/SLOT (Normal speed=44.1KHz, Double speed=88.2KHz)
	12	ADATA	O	Serial audio data output of 48 bit/SLOT (MSB first)
	13	DVSS1		Digital Ground 1
	14	BCK	O	Audio data Bit clock for 48 bit/SLOT (Normal speed=2.1168KHz, Double speed=4.2336KHz)
	15	C2PO	O	C2 pointer for output audio data
	16	VREFL2	I	Input terminal 2 of reference voltage "L" (Floating)
	17	VREFL2	I	Input terminal 1 of reference voltage "L" (GND Connection)
	18	AVDD2		Analog VCC2
	19	RCHOUT	O	Right-Channel audio output through D/A Converter
	20	LCHOUT	O	Left-Channel audio output through D/A Converter
	21	AVSS2		Analog Ground 2
	22	VREFH1	I	Input terminal 1 of reference voltage "H" (V_{DD} Connection)
	23	VREFH2	I	Input terminal 2 of reference voltage "H" (Floating)
	24	EMPH	O	Emphasis/Non-Emphasis Output ("H" : Emphasis)
	25	LKFS	O	The Lock Status output of frame sync
	26	SOS1	O	Output of subcode sync signal (S0+S1)
	27	RESET	I	System reset at "L"
	28	SQEN	I	SQCK I/O Control ("L" : internal CK, "H" : external CK)
	29	SQCK	I/O	Clock for output Subcode-Q data
	30	SQDT	O	Serial output of Subcode-Q data
	31	SQIK	O	The CRC check result signal output of subcode-Q
	32	SBCK	I	CLOCK for output subcode-Q data
	33	SDAT	O	Subcode serial data output
	34	$DV_{DD}1$		Digital Vcc1
	35	MUTE	I	Mute control Input ("H" : Mute ON)
	36	MLT	I	Latch Signal Input from Micom
	37	MDAT	I	Serial data Input from Micom
	38	MCK	I	Serial Clock Input from Micom
	39	DB8	I/O	SRAM datd I/O Port 8 (MSB)
	40	DB7	I/O	SRAM datd I/O Port 7
	41	DB6	I/O	SRAM datd I/O Port 6
	42	DB5	I/O	SRAM datd I/O Port 5
	43	DB4	I/O	SRAM datd I/O Port 4
	44	DB3	I/O	SRAM datd I/O Port 3
	45	DB2	I/O	SRAM datd I/O Port 2
	46	DB1	I/O	SRAM datd I/O Port 1 (LSB)

IC	Pin no.	Symbol	I/O	Description
	47	C1F1	I/O	Monitoring output for C1 error correction (RA1)
	48	C1F2	I/O	Monitoring output for C1 error correction (RA2)
	49	C2F2	I/O	Monitoring output for C2 error correction (RA3)
	50	C2F2	I/O	Monitoring output for C2 error correction (RA4)
	51	C2FL	I/O	C2 decoder flag (High : When the processing C2 code is impossible correction state) (RA5)
	52	/PBCK	I/O	Output of VCO/2 (Normal speed=4.3218MHz, Double speed=8.6436MHz) (RA6)
	53	DV_{SS2}		Digital Ground 2
	54	FSDW	I/O	Unprotected frame sync (RA7)
	55	ULKFS	I/O	Frame sync protection state (RA8)
	56	/JIT	I/O	Display of either RAM overflow or underflow for ±4 frame Jitter margin RA9)
	57	C4M	I/O	Only monitoring signal (Normal playback : 4.2336KHz) (RA10)
	58	C16M	I/O	16.9344MHz signal output (RA11)
	59	/WE	I/O	Terminal for test
	60	/CS	I/O	Terminal for test
	61	SEL1	I	Mode Selection Terminal 1(H : 33.8688MHz, L : 16.9344MHz)
	62	SEL2	I	Mode Selection Terminal 2(H : APLL L : DPLL)
	63	SEL3	I	Mode Selection Terminal 3(H : CDROM L : CDP)
	64	SEL4	I	Mode Selection Terminal 4(H : Internal SRAM)
	65	TEST	I	Test Terminal (L=Normal operating state)
	66	EFMI	I	EFM Signal input
IC401	67	APDO	O	Charge Pump output for analog PLL
	68	/ISTAT	O	The internal status output
	69	TRCNT	I	Tracking counter input signal
	70	LOCK	O	Output signal of LKFS Condition sampled PBFR/16 (If LKFS is "H", Lock is "H". If the LKFS is sampled "L" at least 8 times by PBFR/16, Lock is "L")
	71	PBFR	O	Write frame clock (Lock : 7.35KHz)
	72	SMEF	O	LPF time constant control of the spindle servo error signal
	73	SMON	O	ON/OFF control signal for spindle servo
	74	DV_{DD2}		Digital Vcc 2
	75	SMPD	O	Spindle Motor drive (Rough control in the CLV-S mode, phase contol in the CLV-P mode)
	76	SMSD	O	Spindle Motor drive(Velocity Contol in the CLV-P mode)
	77	$VCco_1$	O	Vco output signal (When the state is lock by means of PBFR, it is 8.643MHz)
	78	$VCco_1$	I	Vco input signal
	79	DSPEED	I	Double speed mode control (H : Normal Speed, L : Double spindle
	80	APD02	O	Analog PLL Charge Pump output for Double Speed mode

IC	Pin no.	Symbol	I/O	Description
IC303	1	DO1.1	O	DRIVE OUTPUT
	2	DO1.2	O	DRIVE OUTPUT
	3	DI1.1	I	DRIVE INPUT
	4	DI1.2	I	DRIVE INPUT
	5	REG		REGULATOR
	6	REO	O	REGULATOR OUTPUT
	7	MUTE		MUTE
	8	GND1		GROUND
	9	DI2.1	I	DRIVE INPUT
	10	DI2.2	I	DRIVE INPUT
	11	DO2.1	O	DRIVE OUTPUT
	12	DO2.2	O	DRIVE OUTPUT
	13	GND2		GROUND
	14	OPOUT	O	OPAMP OUTPUT
	15	OPIN(−)	I	OPAMP INPUT(−)
	16	OPIN(+)	I	OPAMP INPUT(+)
	17	DO3.1	O	DRIVE OUTPUT
	18	DO3.2	O	DRIVE OUTPUT
	19	DI3.1	I	DRIVE INPUT
	20	DI3.2	I	DRIVE INPUT
	21	VCC1		SUPPLY VOLTAGE
	22	VCC2		SUPPLY VOLTAGE
	23	VREF		2.5V BIAS VOLTAGE
	24	DI4.1	I	DRIVE INPUT
	25	DI4.2	I	DRIVE INPUT
	26	DO4.1	O	DRIVE OUTPUT
	27	DO4.2	0	DRIVE OUTPUT
	28	GND3		GROUND

CIRCUIT DESCRIPTION

1. APC CIRCUIT

A semiconductor laser is used as the light source for the optical pickup. As the output from the semiconductor laser changes radically with changes in temperature, a circuit must be provided to stabilize this output. For this purpose, a monitor diode which detects the optical output of the laser diode is used in the semiconductor laser.

As the laser diode emits light from its bonded surface, light is emitted both in front and behind. The light emitted behind is monitored with the monitor diode installed on its rear surface, and the optical output is thus controlled, the light emitted in front becomes the light source for the pickup.

Fig. 1 shows the APC circuit.

When the temperature rises and the optical output decreases, the monitor diode current (IS) decreases, the electric potential of IC301 pin 70 rises, the base current of the driving transistor increases, and the laser diode current increases. This causes the reduced optical output to return to its former level.

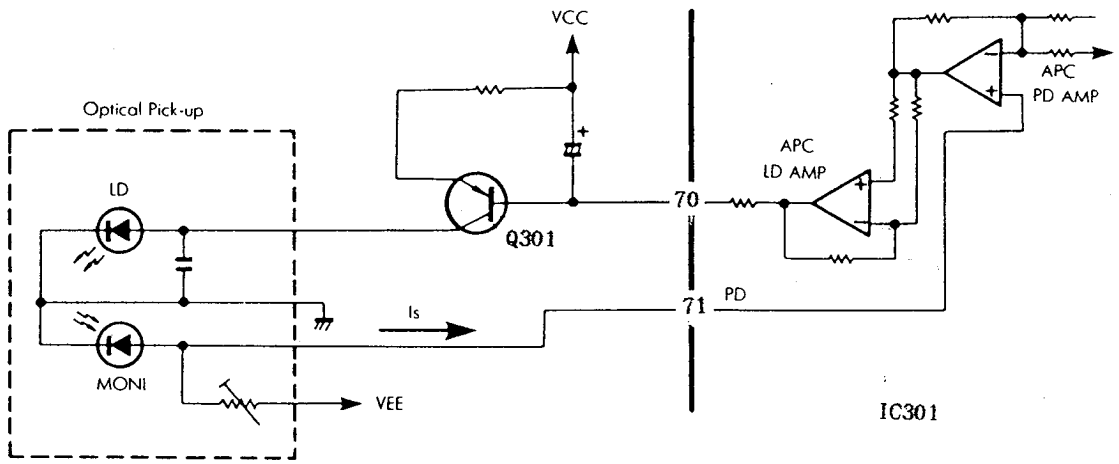


Fig. 1

2. FOCUS SERVO

2-1. Optical pickup

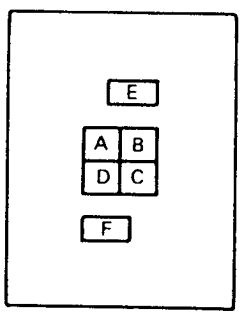
This set employs a three-beam optical pickup comprised of six division photodiodes. A through F as shown in Fig. 2. The four photodiodes (A through D) at the center provide focus error detection by using their property to allow the beam to focus into a round image only at a certain point.

The sums of outputs from diagonal two elements of four division photodiodes (A+C and B+D) are compared by the differential amplifier in IC301 to detect the shape of the beam image.

The remaining two diodes (E and F) provide tracking error detection by means of sub-beam spots.

2-2. Focus error detecting operation

The reflected laser beam from a disc is polarized 90° with the beam-splitter and sent to the cylindrical lens. The beam passed through this cylindrical lens is then sent to the four division photodiodes and focuses into an image whose shape varies with the distance between the disc and the objective lens. Such change in the beam shape causes the current flowing from the photodiodes to vary.

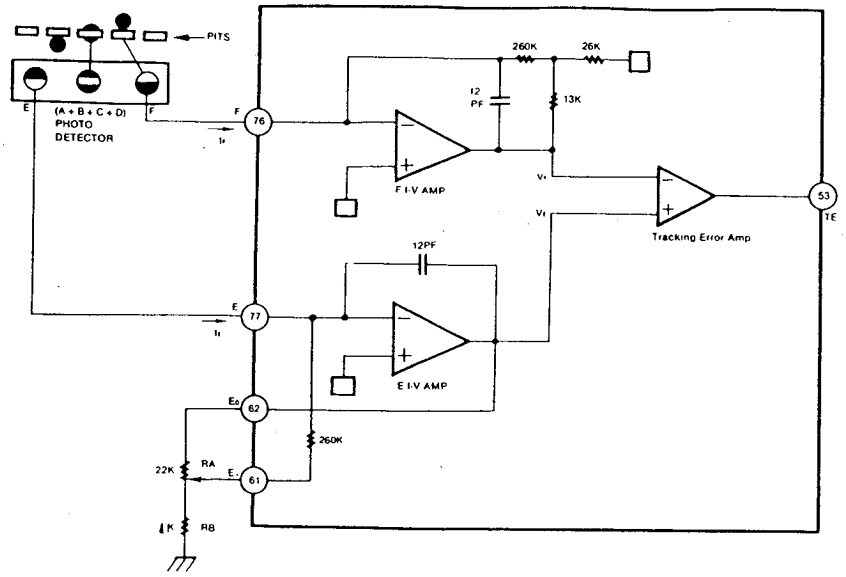


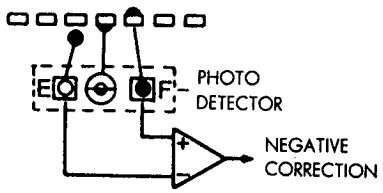
Three spotted (six-division) photo diodes

Fig. 2

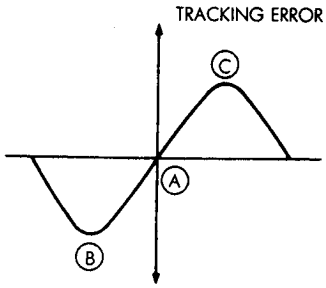
The currents from the photodiodes (A+C and B+D) are applied to pins 74 and 75 of IC301 and converted to voltage by RF I-V amplifiers (1) and (2) included in IC301

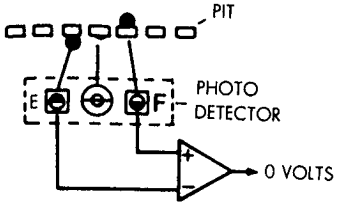
3. TRACKING ERROR AMPLIFIER





(B) TRACKING ERROR





(A) TRACKING CORRECT

The output of photo detector F is directed to the (−) input of F I-V AMP and out of photo detector_E is directed to the (−) input of E I-V AMP.

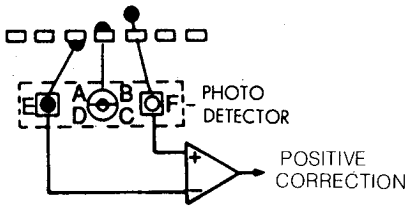
These input signals are current.

E I-V AMP and F I-V AMP are converted into voltage from the current signal. When correct tracking, two **input (V_F, V_E) Signals are equal. The occurrence of tracking error is due to difference between** F I-V AMP output and E I-V AMP output.

$$V_F = I_F \times \left[\frac{(260K \times 13K)}{26K} + 273K\right] = I_F \times 403K$$

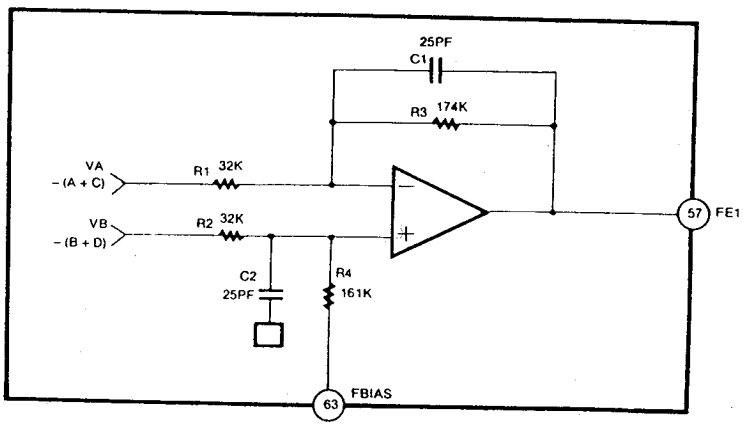
$$V_E = I_E \times \left[\frac{R_A}{R_B + 22K} \times 260K + (R_A + 260K)\right]$$

accordingly, $V_{TE1} = (I_E - I_F) \times 1290K$



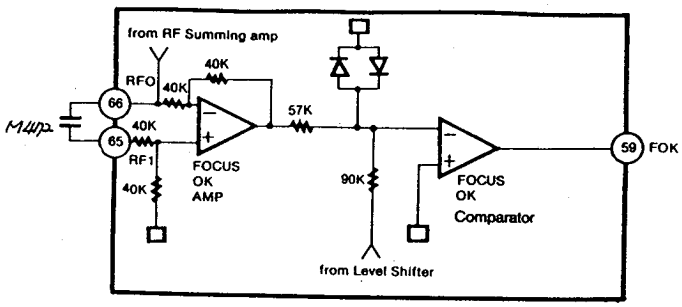
(C) TRACKING ERROR

4. FOCUS ERROR AMPLIFIER



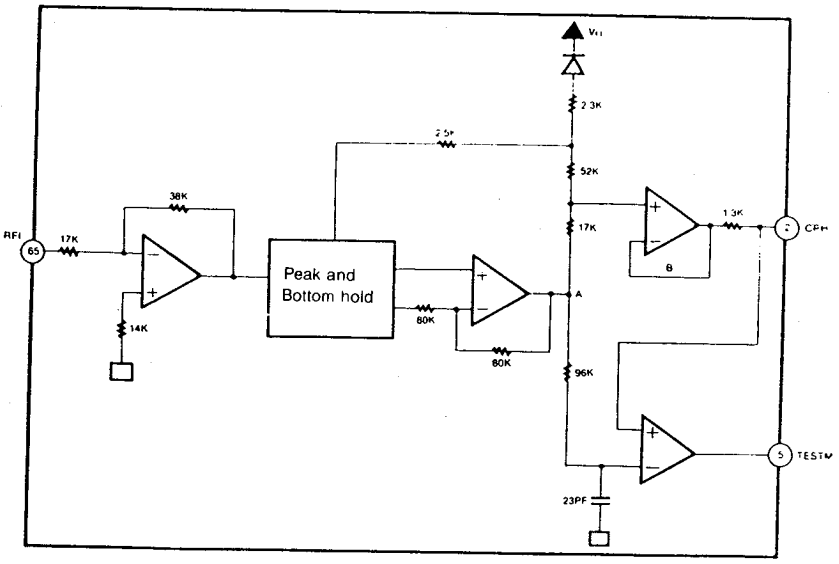
The focus error amp is the difference between RF I-V AMP (1) output V_A and RF I-V AMP (2) output V_B.
This two (V_A. V_B) Signals are each applied to the (−) and (+) input of focus error amp
As the result of differential voltage. Focus error signal appears at FE 1 Pin(Pin57).
This FE1 Output Voltage (low frequency) becomes (A+C)−(B+D). as follows $V_{FE1} = R_1/R_2(V_B - V_A)$.
The focus error voltage is directed to the focus servo Block, to maintain optimum focusing at all times.

5. FOCUS OK GENERATION CIRCUIT



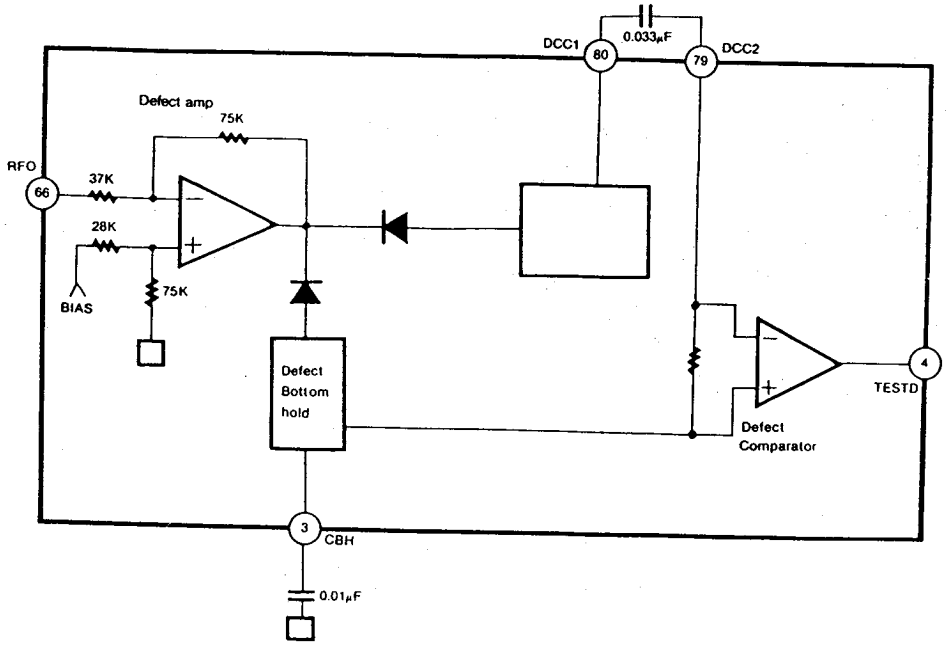
The focus ok circuit generates a timing window to monitor focus search status of focus servo.
When RFO (Pin 66) Voltage is more than −0.37V, the focus OK circuit is inverted. Time constant of HPF in EFM comparator and in mirror circuit and that of lpf in focus ok circuit are determined by Capacitor (M472) between RFI and RFO.

6. MIRROR CIRCUIT



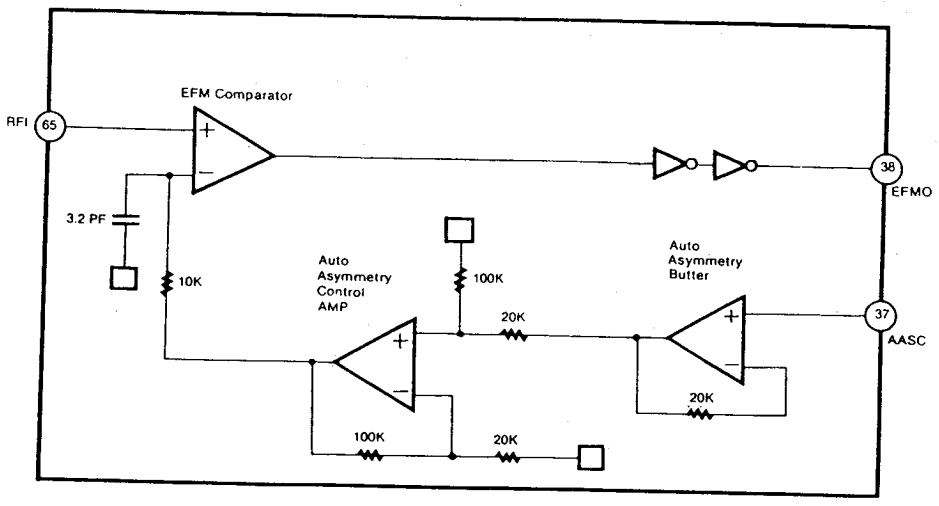
After RF input signal is amplified by Mirror amp, it is held in Bottom and peak hold circuit. Such a hold is determined by the time constant. Envelope signal A (demodulated to DC) is two-thirds of the peak value of this signal the time constant of A signal is held when it is larger than that of B signal.
Therefore, mirror output is:Low at track on disc, High at between tracks on disc, High when detect is detected.

7. DEFECT CIRCUIT



The RFI signal bottom, after being inverted, is held with two time constants, one long and one short.
The short time-constant bottom hold is done for a disc mirror defect more than 0.1 msec.
The long time-constant bottom hold is done with the mirror level prior to the defect. By differentiating this with a capacitor coupling and shifting the level, both signals are compared to generate the mirror defect detection signal.

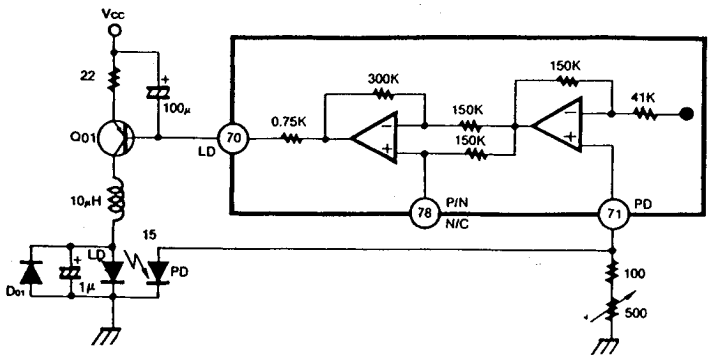
8. EFM COMPARATOR



The EFM COMPARATOR Converts a RF Signal into a binary signal. A processing of disc production is occured disproportion because of modification of disc.
That is not reduced by only Ac coupling.
The reference voltage of EFM COMPARATOR is controlled utilizing the fact that the generation-probability 1.0 is 50% (duty) in the binary EFM signal.

9. APC(AUTOMATIC POWER CONTROL) CIRCUIT

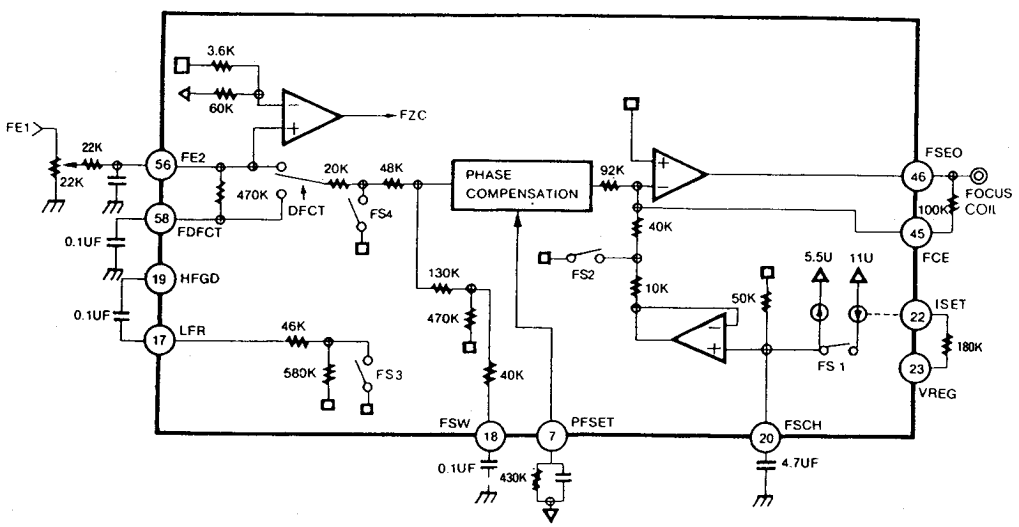
A. +5V single Power Supply P-sub Laser



As the laser diode has large negative temperature characteristics in its optical output when driven with a constant current, the output must be a controlled current to obtain a constant output power with a monitor photo diode. This constitutes the APC circuit.
The KA9220B covers all the LD P-sub/N-sub and ±5V dual power supply/5V single power supply.

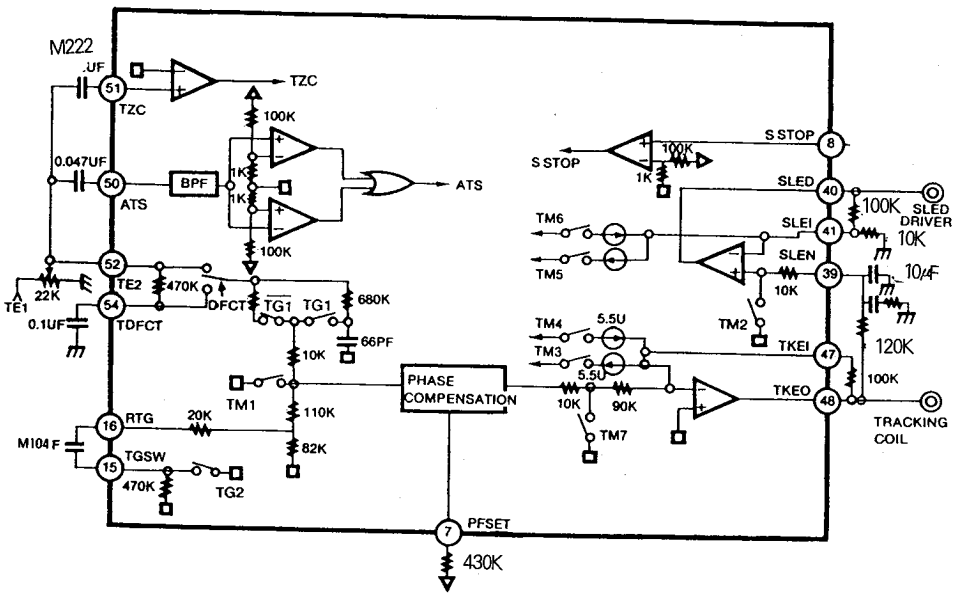
10 SERVO BLOCK

10-1. FOCUS SERVO BLOCK



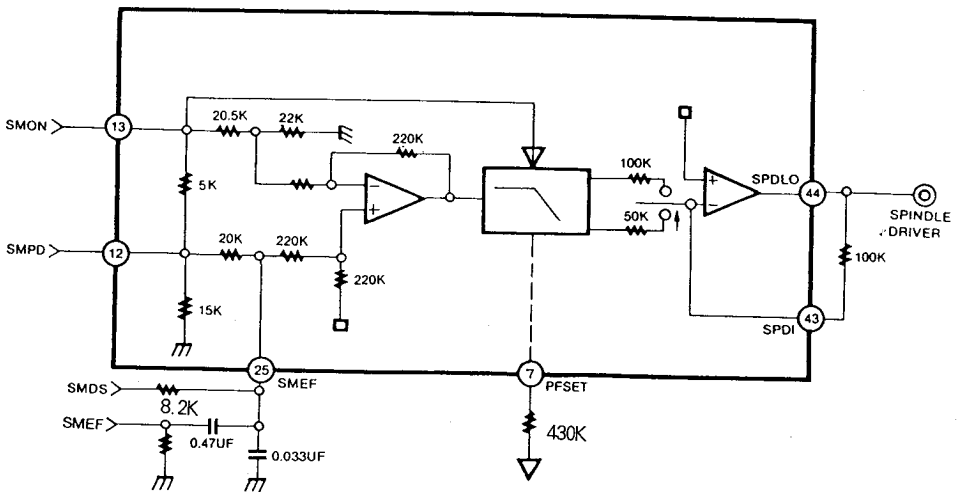
When the defect signal is detected, the focus servo Loop is isolated.
At this time, the focus servo error output is outputed through low pass filter formed by connecting a capacitor (0.1μF) between the built-in 470KΩ resistor and FDFCT Pin (Pin58). Accordingly, the focus error output is held as just before error value during the defect.
The peak frequency of the focus phase compensation is at about 1.2KHz when the resistor connected to PFSET (Pin7) is 510KΩ. It is inversely proportional to the resistor connected to the Pin 7.
While the focus search is operating, the FS4 switch is ON and then Focus error signal is isolated, accordingly it is outputed by FSEO Pin (Pin46).
When the FS2 switch is ON, the focus servo Loop is on and then the focus error is outputed through the focus servo Loop.

10-2. TRACKING AND SLED SERVO LOOP



The capacitor across RTG (Pin16) and TGSW (Pin15) reduce high frequency gain when the TG2 Switch is OFF. The Peak-frequency of the tracking Phase Compensation is at about 1.2KHz when the resistor connected to PFSET (Pin7) is 510kΩ. It is inversely proportional to the resistor connected to the Pin 7.
The tracking error signal is switched into low pass filter route formed by connecting a capacitor between the built-in resistor at DFCT (470kΩ) and Pin54 (TDFCT) as for tracking error signal.

10-3. SPINDLE SERVO AND LOW PASS FILTER



The 0.033μF AND THE 20 KΩ connected to Pin25(SMEF) form the 200MHz LOW Pass filter.
And the carrier component of spindle servo error signals is eliminated.
In the CLV−S mode, SMEF becomes L and Pin25 LPF fc lowers, strengthens the filter further.

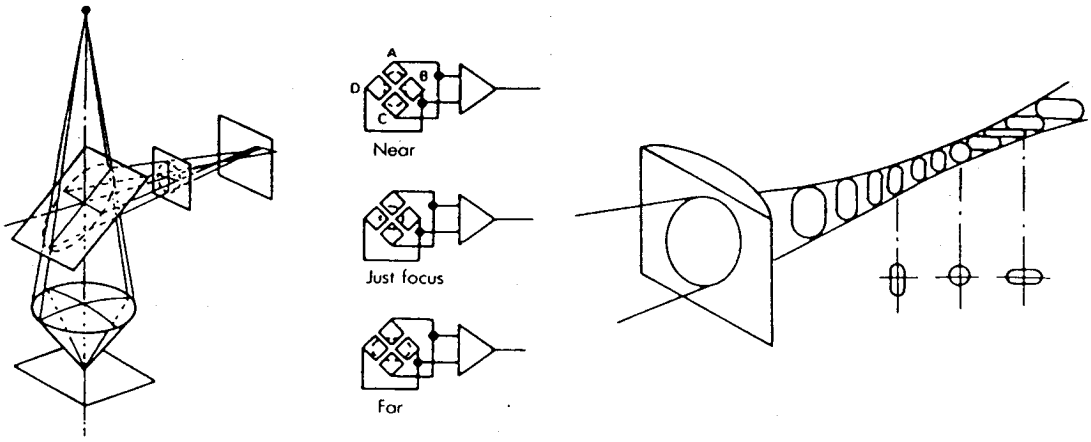


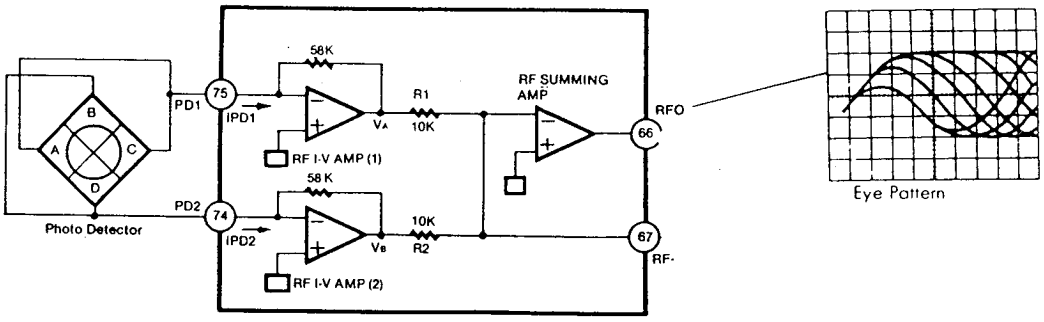
Fig.7

11. RF AMP BLOCK

11-1. Description

The KA9220B is designed for 3-spot type optical pick-up assembly. The photo detector is composed of 6 light sensor (A through F). The photo detector A, B, C and D detect audio modulation signal on the disc and generate focus error signal.
The E and F photo detectors generate tracking error signal.

11-2. RF AMPLIFIER



RF I-V AMP(1) and RF I-V AMP (2) are converted current of PD1(A+C) and PD2(B+D) through the 58 Kohm internal resistor into Voltage.
Furthermore. they are added to RF Summing amplifier.
This signal (A+B+C+D) is output from RFO (Pin66).
The output Voltage is as follow.

$V_{RFO} = -R3 \times (iPD + iPD2)$

$= -R3 \times (\frac{V_A}{R_1} + \frac{V_B}{R_2})$

$= -22K \times (\frac{V_A}{10K} + \frac{V_B}{10K})$

$= -2.2 \times (V_A + V_B)$

11-3. EFM demodulation, error correction, serial/parallel conversion

EFM demodulation, error correction and serial/parallel conversion are performed by the internal circuitry of IC401 The eye-pattern signals from pin 38 of IC301 are sent to pin 66 of IC401 then demodulated from 14 bits to 8bits by EFM readjustment. At the same time any error, if found, is corrected (CIRC) and the signals are sent to the D/A converter interface. After that, they are output as 18-bit digital signals from pins 11 12 and 14 of IC401 and fed to the D/A converter of IC101.

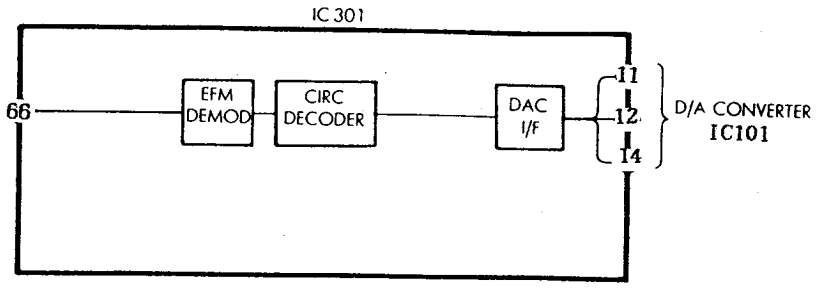


Fig.8

12. 1-bit D/A Converter

Conventionally, high-precision D/A conversion was mainly carried out using resistor ladder systems. There was, however, one main drawback with these systems, which was that zero cross distortion was likely to be generated. To achieve production of a high-precision D/A converter with a minimum amount of zero cross distortion, it would be necessary to carry out complicated and bothersome processes such as laser trimming processing. In addition, use of such D/A converter would require a sampling-and-hold circuits(or deglitcher circuit) and an intricate analog filter with characteristics When mounting it.

To solve these difficulties, we used a 1-bit D/a converter with 3rd order noise shaping technology (IC101 : MN6474AM)

12-1. Features and Configuration of MN6474AM

Features
1. No zero cross distortion
2. No non linear distortion
3. Built-in 4 times oversampling digital filter
4. 2 channels (left and right) built in
5. 4DAC configuration possible
6. Single 5V power supply operation

The bock diagram is shown in Fig.9. The MN6474AM is configured of a digital filter, a 3rd order noise shaping circuit, and PWM.

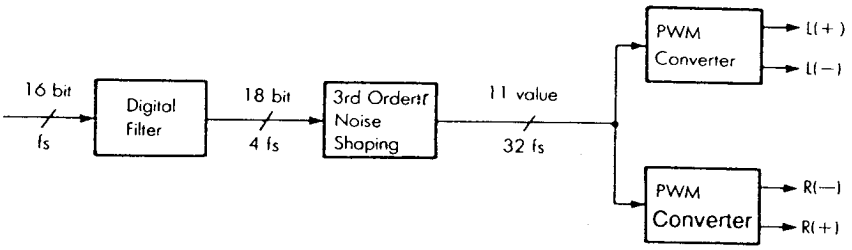


Fig.9

12-2. Configuration of MN6474AM

Fig. 10 shows the configuration of the MN6474AM. The sampling frequency of the input data is expressed in fs, so the 3rd order noise shaping circuit operates at 32fs. This means that a 32-times oversampling filter is required. In this LSI, however, oversampling is carried out first at 4fs in the first digital filter, and following that, a O order hold takes place in the 3rd order noise shaping circuit. This enables conversion of the 4fs signal to a 32fs signal.

The digital filter, using 384fs as clock signals, and the noise shaping section, uses 64fs, carry out time division processing on the data for the left and right channels. The PWM section, using 768fs as a clock signal, carries out signal processing for the left and right channels independently.

In the noise shaping section, the 19-bit 32fs signal is converted to 11 values and pulse width modulation (PWM) in carried out on these signals in the PWM section. D/A conversion is carried out in this way. Following are the descriptions of the various blocks.

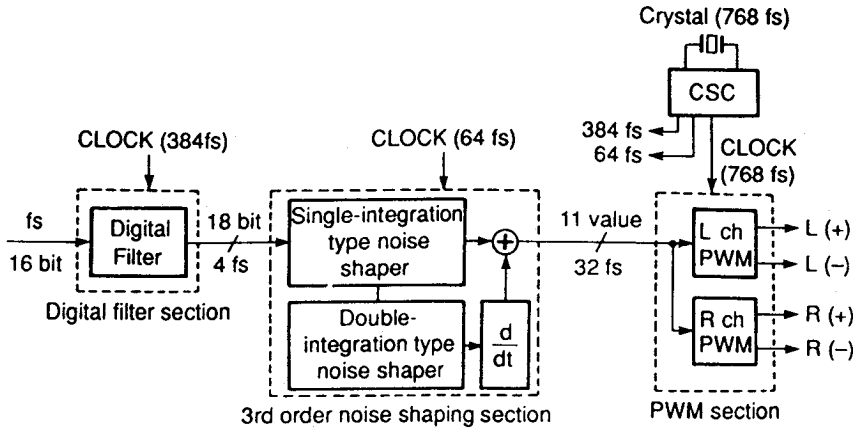


Fig. 10

13. Digital filter

Fig. 11 shows the signal data of an audio signal up to 20KHz that has been digitalized, along with the frequency distribution of the signal data. The graphs show the conditions for a sampling frequency of 44.1KHz, plus its doubled frequency, 88.2KHz, and its quadrupled frequency, 176.4KHz.

As the figure shows, for the same signal up to 20KHz, the noise portion of the digitalized signal component tends to shift toward the higher range of the signal if the sampling frequency is increased. However, at any sampling frequency, the volume of necessary audio signal information remains constant up to 20KHz. This allows certain important results to be derived; that is, if the information represented in section (a) is obtained, then it should be possible to create a signal in the form shown in(b) or (c).

When the noise caused by sampling shifts to the higher frequency range, as shown in (b) or (C), the low pass filter characteristic to eliminate noise during re-conversion to an audio signal need not be steep but can be rather gradual as shown. It is comparatively simple to provide a high audio quality low pass filter of such characteristic with little phase fluctuation or distortion.

The question now becomes how to make a signal sampled at 44.1KHz resemble one sampled at a much higher frequency. Fig. 12 shows the signal sequence sampled at the same 44.1KHz as in Fig. 11 and its frequency distribution.

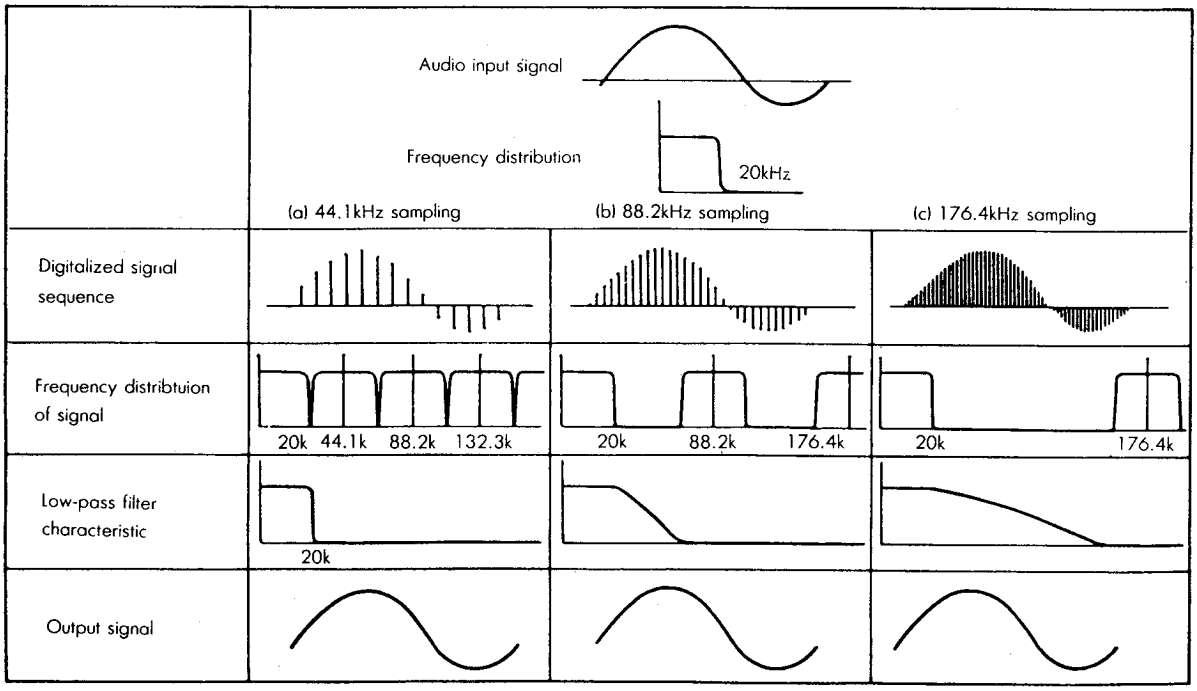


Fig. 11

If the frequency is to be doubled as the first step in increasing the sampling frequency of the signal, zero-level data is added between the data marked with X in Fig. 12(b). In the original signal sequence sampled at 44.1KHz, there are data only at the points of the sampling timing, while the intervals between those points have all been mode zero-level. Introducing zero data in these intervals does not change the original data in any way, nor is the frequency distribution altered. Only the sampling frequency is double.

Passing this data in its modified form through a digital filter with the characteristic shown in Fig. 12(c) causes the portion corresponding to N1 to be eliminated, resulting in a sequence with the frequency distribution shown in (d). This signal sequence possesses exactly the same shape as that obtained for the signal in Fig. 11(b), sampled at 88.2KHz. In other words, this method enables the sampling frequency to be doubled.

The digital filter used in this unit is a Finite Inpulse Response type. Its circuit diagram is shown in Fig. 13.

The sampling frequency of this unit has been quadrupled, and the phase characteristic has been improved by using a softer analog low-pass filter.

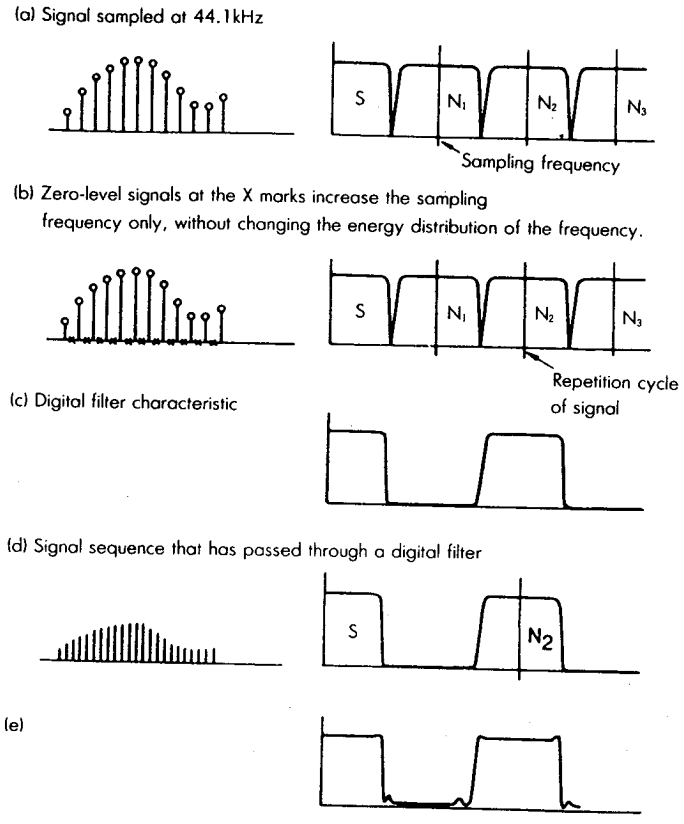


Fig. 12

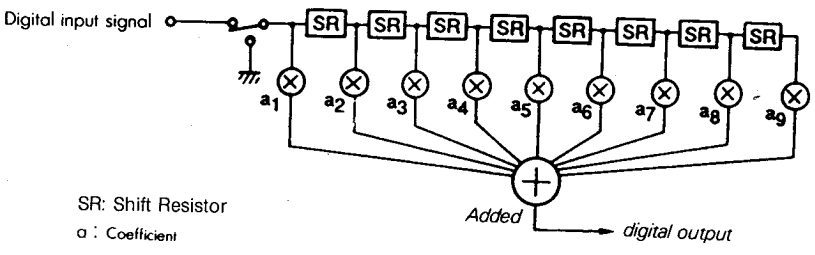


Fig. 13

14. Noise shaper

a) Single-integration noise shaper

The block diagram is shown in Fig. 14.

According to the figure, the relation between input X nd outpu: is as follows :

$Y = X + (1 - Z^{-1})V_q \cdots (1)$

The quantization error V_q is a random value, and $(1 - Z^{-1})$ expresses the differential characteristic. Thus, according to equation (1), the spectrum of the quantization error V_q for the single-integration noise shaper has a characteristic of 6dB/oct, and the lower the frequency is, the greater the attenuation becomes, (This is because the noise distribution can be changed by the noise shaper).

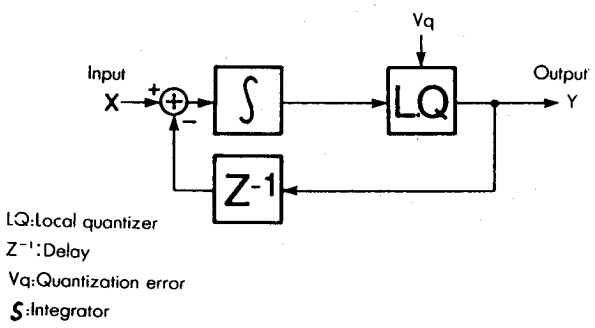


Fig. 14

In Fig. 15. the path to the output seen from W has a configuration identical to that of the single-integration noise shaper. so that relation between W and Y is :

$Y = W + (1 - Z^{-1})V_q \cdots (2)$

The relation between X and Y is :

$W \frac{1}{1-Z} (X - Z^{-1}Y) \cdots (3)$

And the result obtained from above equations (2) and (3) is :

$Y = X + (1 - Z^{-1})^2 V_q \cdots (4)$

Comparison with equation (1) shows that the term $(1 - Z^{-1})$ is a square of itself. In other words, with the double-integration noise shaper, the spectrum of the quantization error V_q is attenuated at a slope of 12dB/oct.

15. 3rd order noise shaper

The block diagram of the 3rd order noise shaper is shown in Fig. 17.

This configuration shows that the first stage uses a single-inte gration noise shaper and the following stage uses a double-inte gration noise shaper. The quantization error of the first stage is input at the second stage.

In this configuration. single-integration and double-integration noise shapers are connected at several stages, and the quantization error of the previous state is quantified again at the following stage, so that the quantization error included in the output of the previous stage in negated. In this way, compensation is carried out.

b) Double-integration noise shaper

The block diagram is shown in Fig. 15.

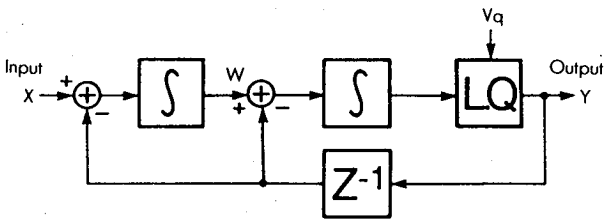


Fig. 15

Fig. 16 shows the output spectrum of the noise shaper.

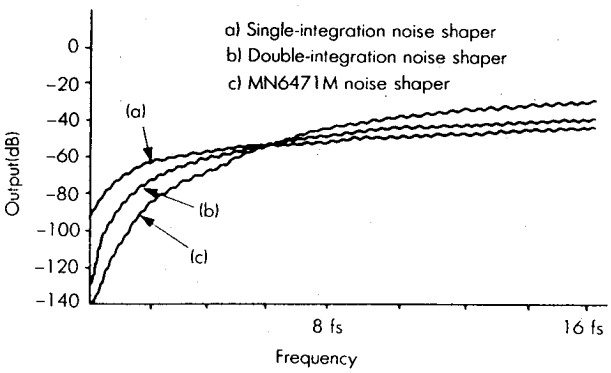


Fig. 16

In this noise shaping circuit, the inout is expressed as X, the output as Y, and the re-quantized error as V_q, and their relation is each order is shown in the following equations.

(1st order) $Y = X + (1 - Z^{-1})V_q$

(2nd order) $Y = X + (1 - Z^{-1})^2 V_q$

(3rd order) $Y = X + (1 - Z^{-1})^2 V_q$

In noise shaping, as the order of the transfer coefficient calied $(1 - Z^{-1})$ becomes larger, the noise in the 1/2fs audio band moves higer in the frequency range. The result is that, within a narrow audio condition, an 18-bit performance can be obtained from a 1-bit.

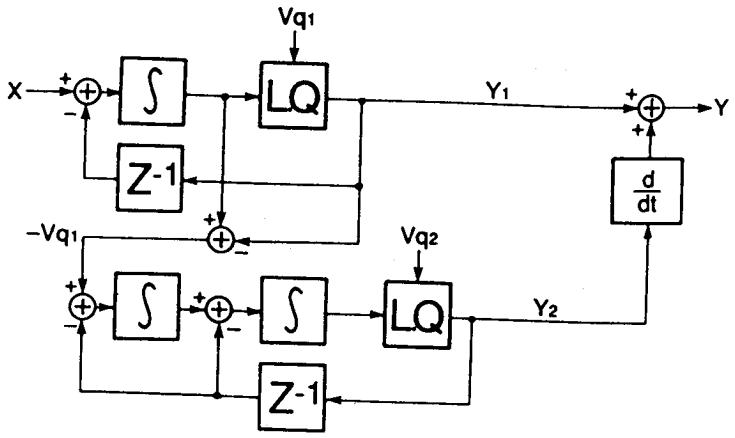


Fig. 17

$Y_1 = X + (1-Z^{-1})V_{q1}$ ..... (5)
$Y_2 = V_q{}^1 + (1-Z^{-1})^2 V_{q2}$ ..... (6)
$Y = Y_1 + (1-Z^{-1})^2 Y_2$ ..... (7)

The result obtained from above equations (5)-(7) :

$Y = X + (1-Z^{-1})^3 V_q{}^2$ ..... (7)

16. PWM Output Section

In the output from the MN6471M noise shaper, the 11 value data of the 32fs is output. In the PWM section, pulse width modulation (PWM) is carried out on that signal, enabling D/A conversion. Fig. 18 shows the PWM section of the MN6471M.

The 11 value digital data output from the noise shaper is converted (1-bit data stream) to pulse signal With 11 pulse widths precisely controlled by the crystal OSC and output as an analog signal. In the PWM output section, signals from both left and right channels are outputed as differenitial output so that the synchronous-phase noise is eliminated and the 2nd order high-frequency distortion is reduced.

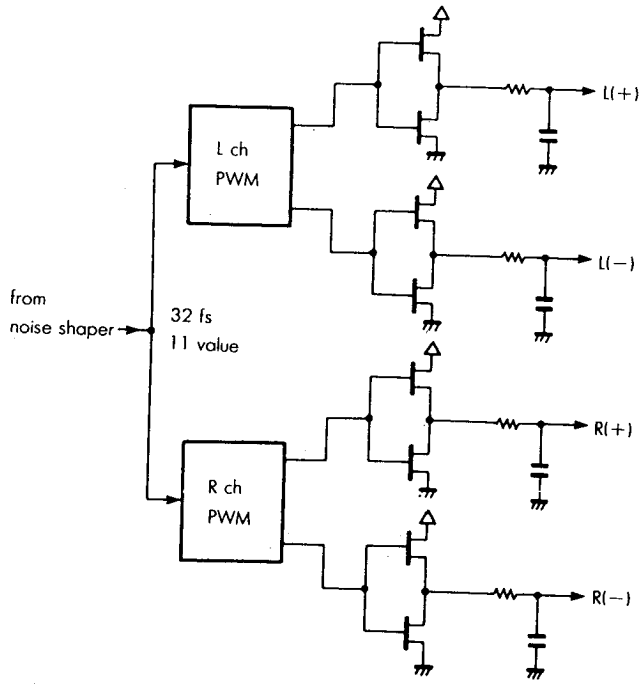


Fig. 18

17. Audio Circuit

Fig. 19 shows a block diagram of the audio circuit.

The outputs from Pin 14{OUT L(I)} and Pin 11 OUT(−) pass through the 2-step LPF which consists of C114, R108 and R107 for one and C116 and R111 for the other, and the high frequency component of the PWM output from DAC is removed.

Then the (+) side component of the PWM is inputted directly, and its (−) side component through the inverted darlington buffer circuit consisting of Q104 and Q106 to the discrete circuit amplifier consisting of Q108, Q112, Q110 and Q114 where they are synthesized into an approximately 2V signal voltage which is then output to the LPF circuit of the next stage.

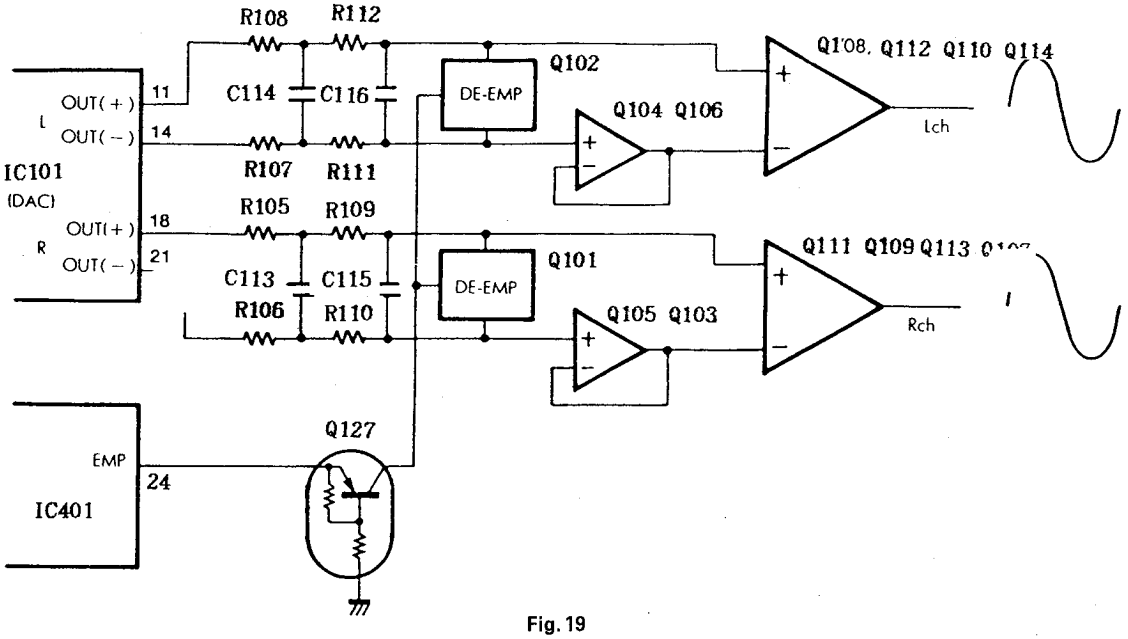


Fig. 19

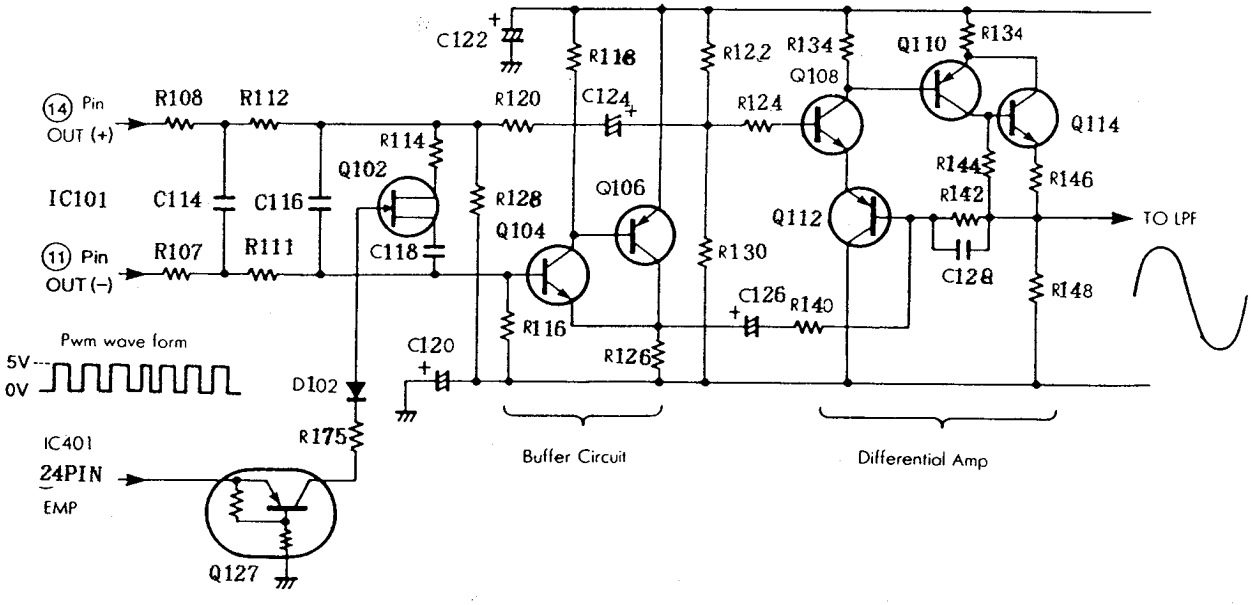


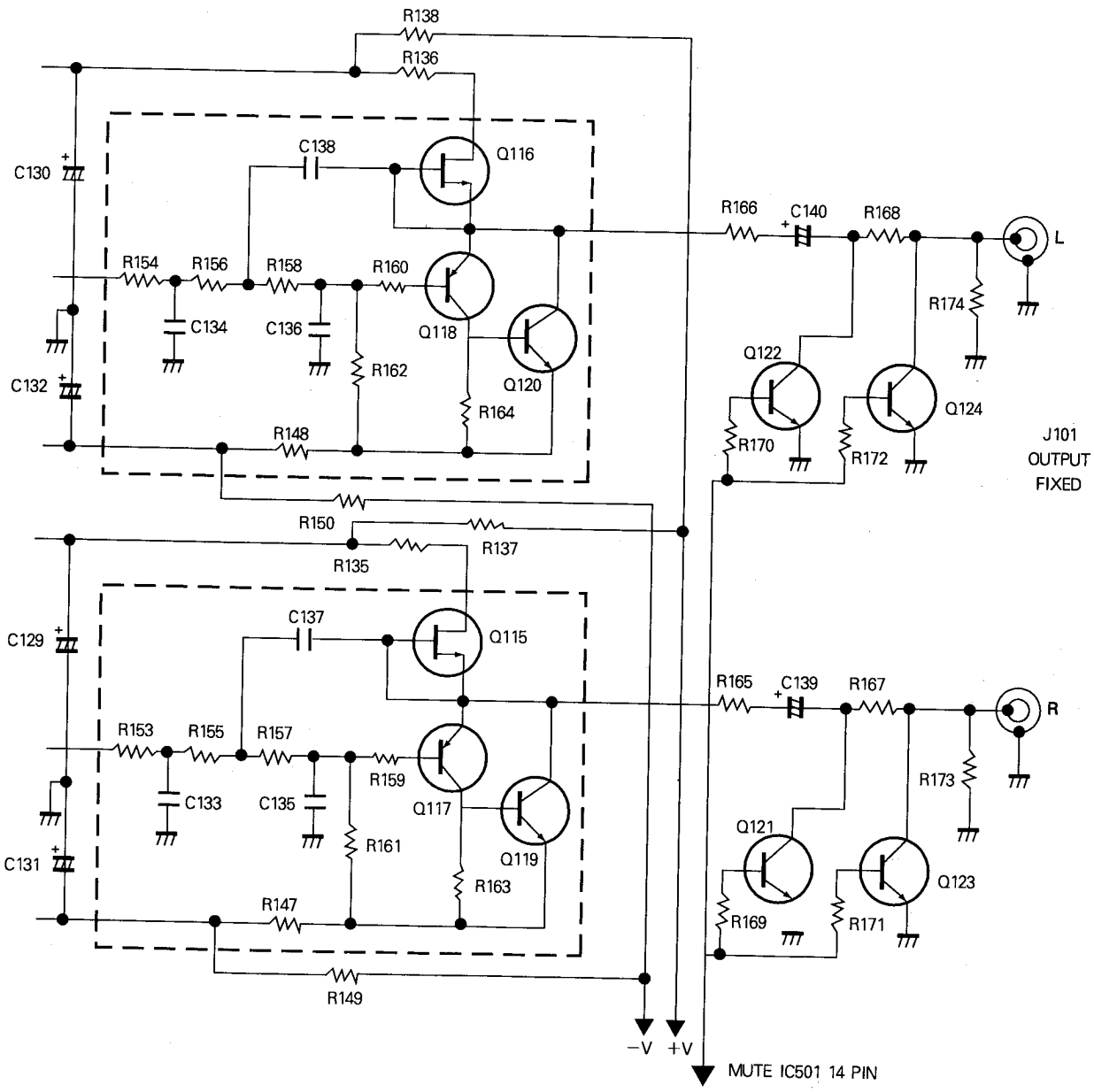
Fig. 20

The emphasis data from the disc is output through the terminal (Pin24) of IC401. When a disc to which emphasis is applied is played back this terminal is set high and Q127 turns ON. Following this, Q102 is also turned ON. Then connected C118 and R114 provides the de-emphasis characteristics. Fig. 20 shows the buffer circuit and the differential amplifier. (Right channel only)

18. Low-Pass filter

Fig. 21 shows a final-stage circuit which includes a low-pass filter and other elements.

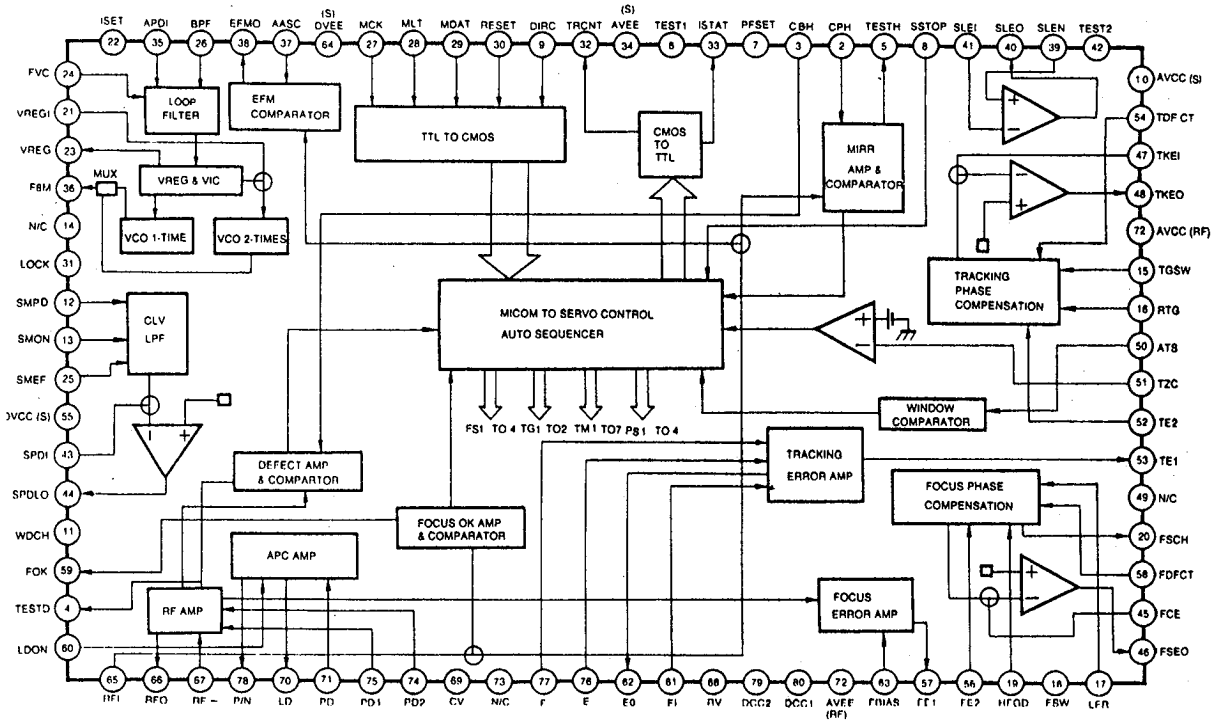
The portion of Fig. 21 enclosed by the broken line is 3rd-other active LPF. This LPF causes noise in the high range to be cut. Q118 and Q120(Left channel) and Q117 and Q119(Right channel) are buffer circuit of inverted darlington configuration. Q116 and Q115 are FET controlled constant current circuits. Q115, Q116, Q122, Q121, Q123 and Q124 is power muting circuit.



IC BLOCK DIAGRAM

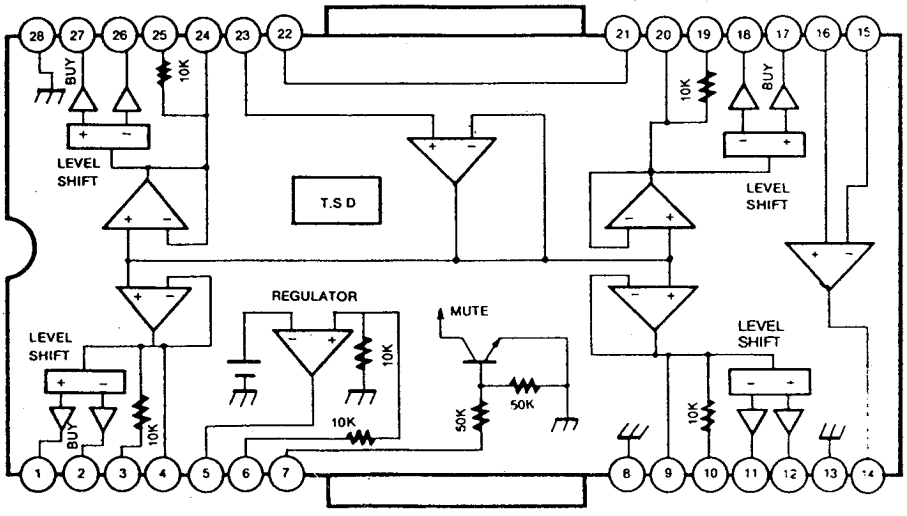
KA9220B (IC 301)

RF AMP+SSP(Signal Servo processor)

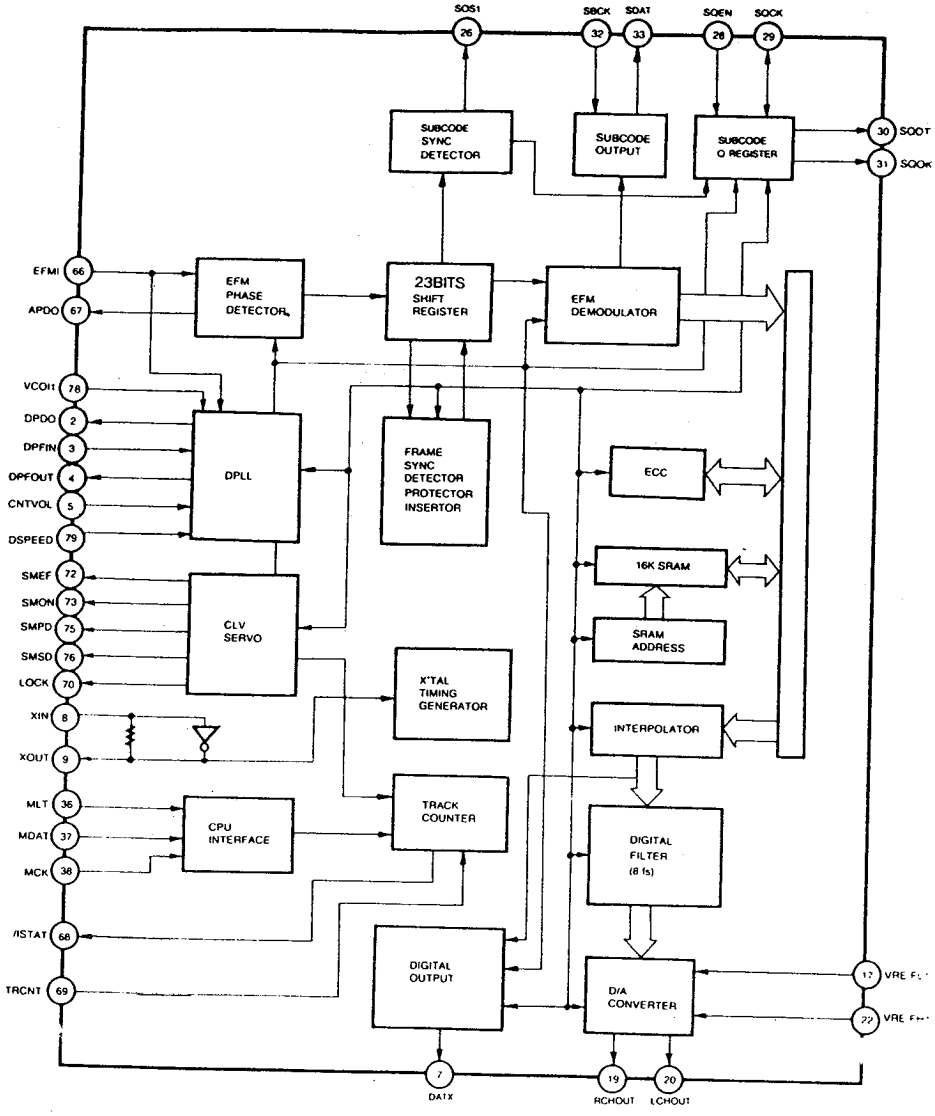


KA9258D (IC 303)

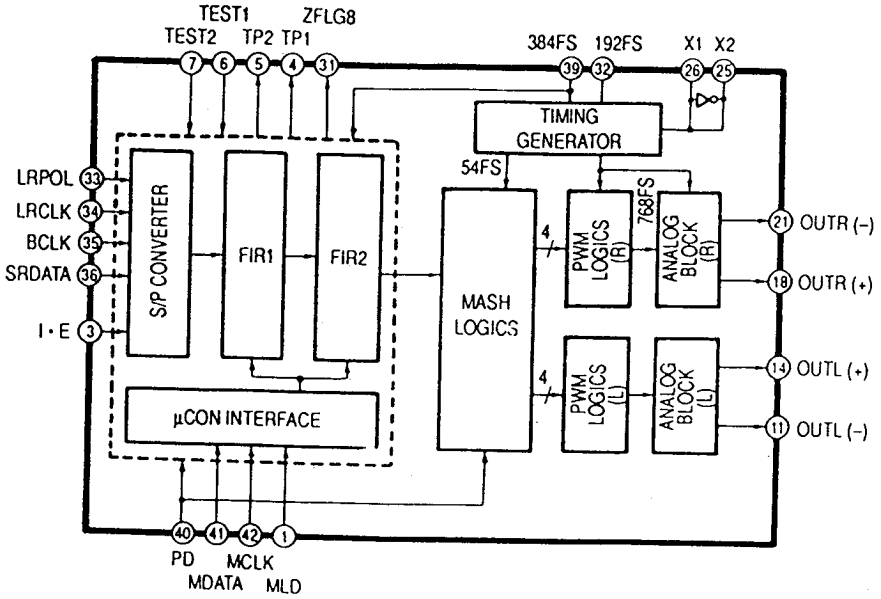
4Channel Motor Driver



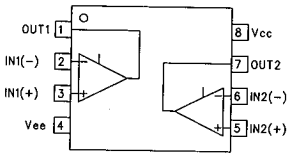
KS9282B (IC 401)
Digital Signal Processor



MN6474AM (IC 101)
D/A Converter

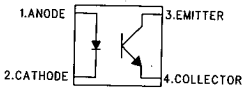


MC4558C (IC302, 601, 602)
2-CH OP-AMP



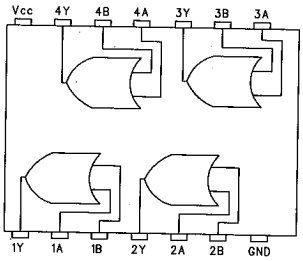
LTV817/PC817 (IC102)

PHOTOCOUPLER IC

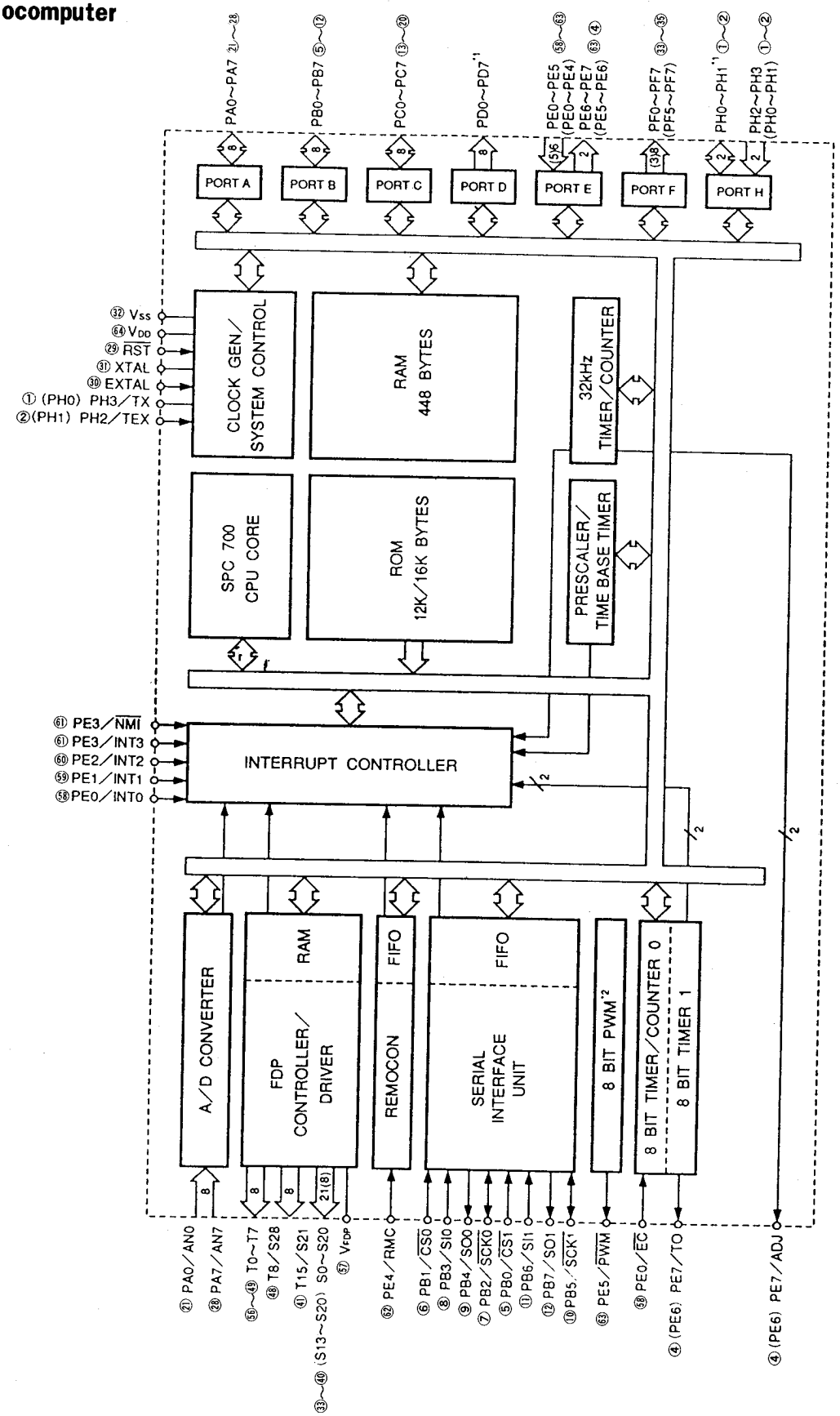


74HC02 (IC502)

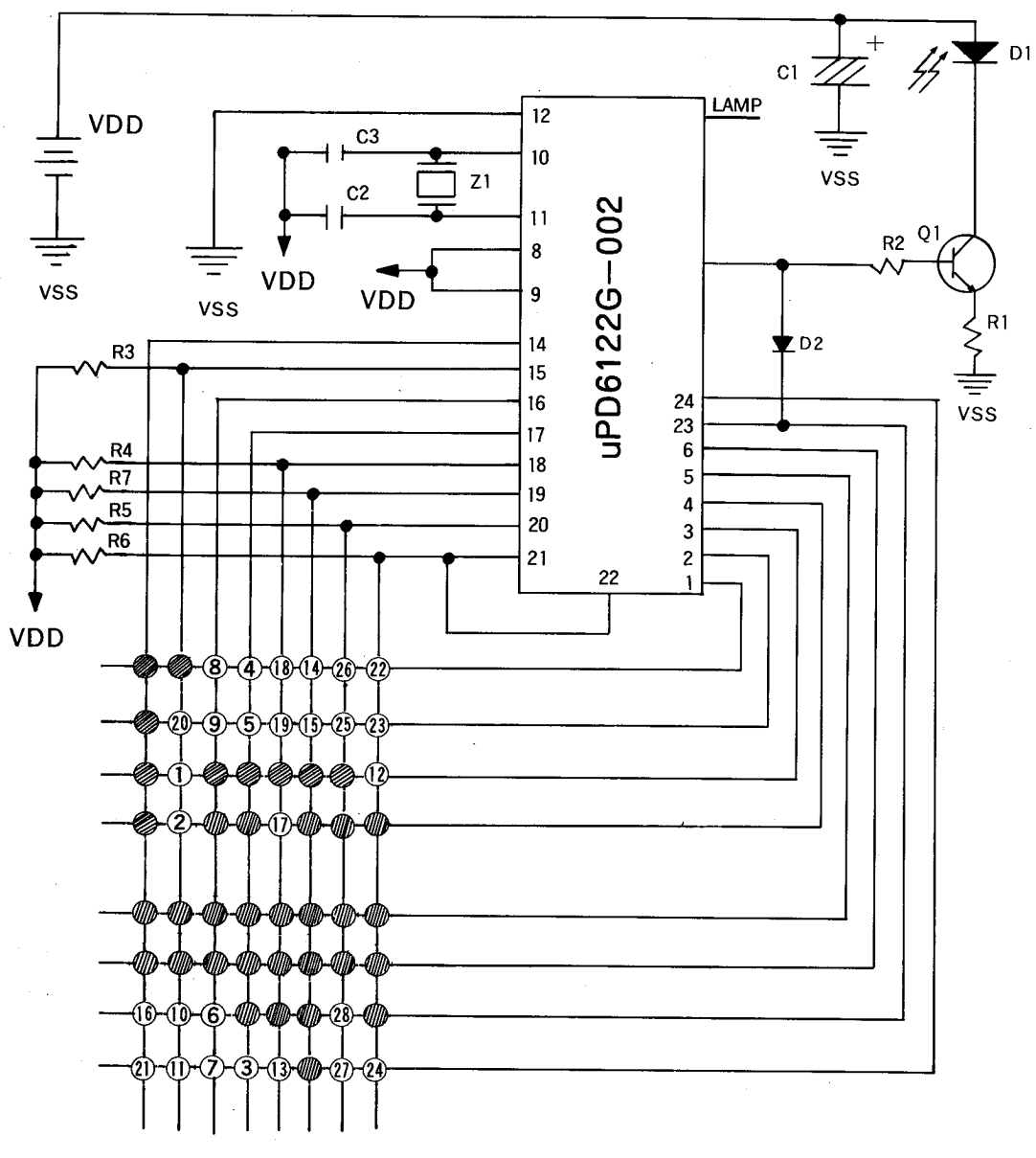
TTL IC



LE1072 : CXP82716 (IC 501)
microcomputer



REMOTE CONTROL SCHEMATIC DIAGRAM



ELECTRICAL PARTS LIST

PCB-1 MAIN P.C.BOARD

CAPACITORS

Part No.	Ref No.	Description
1-9A6-104-64	C1	AXIAL. 1μF/50V
1-886-050-45	C101	CCDSL 5pF/50V CERA.
1-886-050-45	C102	CCDSL 5pF/50V CERA.
1-413-221-65	C104	CEA 220μF/16V ELEC.
1-413-221-65	C108	CEA 220μF/16V ELEC.
1-886-820-45	C113	CCDSL 82pF/50V CERA.
1-886-820-45	C114	CCDSL 82pF/50V CERA.
1-886-330-45	C115	CCDSL 33pF/50V CERA.
1-886-330-45	C116	CCDSL 33pF/50V CERA.
1-506-152-45	C117	CQMA .0015μF/50V MYLAR BK
1-599-152-45	C117	CQPL .0015μF/50V POLY.P IB I
1-506-152-45	C118	CQMA .0015μF/50V MYLAR BK
1-599-152-45	C118	CQPL .0015μF/50V POLY.P IB I
1-413-221-65	C119	CEA 220μF/16V ELEC.
1-413-221-65	C120	CEA 220μF/16V ELEC.
1-413-221-65	C121	CEA 220μF/16V ELEC.
1-413-221-65	C122	CEA 220μF/16V ELEC.
1-413-100-65	C123	CEA 10μF/16V ELEC.
1-413-100-65	C124	CEA 10μF/16V ELEC.
1-413-330-65	C125	CEA 33μF/16V ELEC.
1-413-330-65	C126	CEA 33μF/16V ELEC.
1-886-100-45	C127	CCDSL 10pF/50V CERA.
1-886-100-45	C128	CCDSL 10pF/50V CERA.
1-413-101-65	C129	CEA 100μF/16V ELEC.
1-413-101-65	C130	CEA 100μF/16V ELEC.
1-413-470-65	C131	CEA 47μF/16V ELEC.
1-413-470-65	C132	CEA 47μF/16V ELEC.
1-506-152-45	C133	CQMA. 0015μF/50V MYLAR BK
1-599-152-45	C133	CQPL. 0015μF/50V POLY. P IB I
1-506-152-45	C134	CQMA. 0015μF/50V MYLAR BK
1-599-152-45	C134	CQPL. 0015μF/50V POLY. P IB I
1-506-152-45	C135	CQMA. 0015μF/50V MYLAR BK
1-599-152-45	C135	CQPL. 0015μF/50V POLY. P IB I
1-506-152-45	C136	CQMA. 0015μF/50V MYLAR BK
1-599-152-45	C136	CQPL. 0015μF/50V POLY. P IB I
1-506-562-45	C137	CQMA. 0056μF/50V MYLAR BK
1-599-562-45	C137	CQPL. 0056μF/50V POLY. P IB I
1-506-562-45	C138	CQMA. 0056μF/50V MYLAR BK
1-599-562-45	C138	CQPL. 0056μF/50V POLY. P IB I
1-416-010-65	C139	CEA 1μF/50V ELEC.
1-416-010-65	C140	CEA 1μF/50V ELEC.
1-413-472-67	C208	CEA 4700μF/16V ELEC.
1-413-472-67	C209	CEA 4700μF/16V ELEC.
1-416-470-65	C210	CEA 47μF/50V ELEC.
1-416-470-65	C211	CEA 47μF/50V ELEC.
1-416-470-65	C212	CEA 47μF/50V ELEC.
1-415-221-65	C213	CEA 220μF/35V ELEC.
1-416-479-65	C214	CEA 4.7μF/50V ELEC.
1-416-229-65	C215	CEA 2.2μF/50V ELEC.
1-416-229-65	C216	CEA 2.2μF/50V ELEC.
1-413-470-65	C217	CEA 47μF/16V ELEC.
1-413-101-65	C218	CEA 100μF/16V ELEC.
1-416-220-65	C219	CEA 22μF/50V ELEC.
1-416-100-65	C220	CEA 10μF/50V ELEC.
1-9A3-100-64	C221	AXIAL 10pF/50V
1-9A3-101-64	C222	AXIAL 100pF/50V
1-9A3-220-64	C223	AXIAL 22pF/50V
1-413-331-65	C224	CEA 330μF/16V ELEC.
1-9A3-101-64	C226	AXIAL 100pF/50V
1-413-470-65	C227	CEA 47μF/16V ELEC.
1-413-100-65	C228	CEA 10μF/16V ELEC.
1-413-331-65	C229	CEA 330μF/16V ELEC.
1-416-229-65	C230	CEA 2.2μF/50V ELEC.
1-416-479-65	C232	CEA 4.7μF/50V ELEC.
1-413-221-65	C300	CEA 220μF/16V ELEC.
1-413-221-65	C301	CEA 220μF/16V ELEC.
1-413-221-65	C302	CEA 220μF/16V ELEC.
1-506-103-45	C303	CQMA .01μF/50V MYLAR
1-506-103-45	C304	CQMA .01μF/50V MYLAR
1-506-103-45	C305	CQMA .01μF/50V MYLAR
1-756-473-95	C306	CKDYF .047μF/50V CERA.
1-413-101-65	C307	CEA 100μF/16V ELEC.
1-506-104-45	C308	CQMA .1μF/50V MYLAR
1-506-104-45	C309	CQMA .1μF/50V MYLAR
1-506-104-45	C310	CQMA .1μF/50V MYLAR
1-416-479-65	C311	CEA 4.7μF/50V ELEC.
1-413-330-65	C312	CEA 33μF/16V ELEC.
1-506-333-45	C313	CQMA .033μF/50V MYLAR
1-416-478-65	C314	CEA 0.47μF/50V ELEC.
1-416-478-65	C315	CEA 0.47μF/50V ELEC.
1-506-333-45	C316	CQMA .033μF/50V MYLAR
1-413-470-65	C317	CEA 47μF/16V ELEC.
1-413-100-65	C319	CEA 10μF/16V ELEC.
1-506-683-45	C320	CQMA .068μF/50V MYLAR
1-416-338-65	C321	CEA 0.33μF/50V ELEC.
1-506-682-45	C322	CQMA .0068μF/50V MYLAR
1-506-473-45	C323	CQMA .047μF/50V MYLAR
1-506-222-45	C324	CQMA .0022μF/50V MYLAR
1-506-104-45	C325	CQMA .1μF/50V MYLAR
1-506-222-45	C326	CQMA .0022μF/50V MYLAR
1-413-101-65	C327	CEA 100μF/50V ELEC.
1-756-473-95	C328	CKDYF .047μF/50V CERA.
1-506-104-45	C329	CQMA .1μF/50V MYLAR
1-413-101-65	C331	CEA 100μF/50V ELEC.
1-806-120-45	C332	CCDCH 12pF/50V CERA
1-506-472-45	C333	CQMA .01μF/50V MYLAR
1-806-040-15	C334	CCDCH 4pF/50V CERA
1-506-472-45	C335	CQMA .0047μF/50V MYLAR
1-413-101-65	C336	CEA 100μF/16V ELEC.
1-413-470-65	C337	CEA 47μF/16V ELEC.
1-506-332-45	C338	CQMA .0033μF/50V MYLAR
1-756-473-95	C339	CKDYF .047μF/50V CERA.
1-506-152-45	C403	CQMA .0015μF/50V MYLAR
1-506-473-45	C404	CQMA .047μF/50V MYLAR
1-413-101-65	C405	CEA 100μF/16V ELEC.
1-756-473-95	C407	CKDYF .0473μF/50V CERA

Part No.	Ref No.	Description
1−413−101−65	C408	CEA 100μF/16V ELEC.
1−413−101−65	C409	CEA 100μF/16V ELEC.
1−756−473−95	C410	CKDYF .047μF/50V CERA.
1−413−101−65	C411	CEA 100μF/16V ELEC.
1−756−473−95	C412	CKDYF .047μF/50V CERA.
1−413−101−65	C413	CEA 100μF/16V ELEC.
1−756−473−95	C414	CKDYF .047μF/50V CERA.
1−413−101−65	C501	CEA 100μF/16V ELEC.
1−756−473−95	C502	CKDYF .047μF/50V CERA.
1−886−390−45	C504	CCDSL 39pF/50V CERA.
1−413−330−65	C505	CEA 33μF/16V ELEC.
1−886−560−45	C506	CCDSL 56pF/50V CERA.
1−756−104−95	C507	CKDYF .1μF/50V CERA.
1−413−221−65	C512	CEA 220μF/16V ELEC.
1−413−221−65	C513	CEA 220μF/16V ELEC.
1−506−473−45	C514	CQMA 0.47μF/50V MYLAR
1−413−221−65	C515	CEA 220μF/16V ELEC.
1−413−221−65	C516	CEA 220μF/16V ELEC.
1−413−221−65	C517	CEA 220μF/16V ELEC.
1−413−221−65	C518	CEA 220μF/16V ELEC.
1−413−100−65	C801	CEA 10μF/16V ELEC.
1−9A6−104−64	C901	AXIAL .1μF/50V
1−9A6−104−64	C902	AXIAL .1μF/50V
1−413−221−65	C903	CEA 220μF/16V ELEC.

RESISTORS

1−118−472−25	R101	CBN.F.R. 1/8W 4.7K
1−118−103−25	R105	CBN.F.R. 1/8W 10K
1−118−103−25	R106	CBN.F.R. 1/8W 10K
1−118−103−25	R107	CBN.F.R. 1/8W 10K
1−118−103−25	R108	CBN.F.R. 1/8W 10K
1−118−103−25	R109	CBN.F.R. 1/8W 10K
1−118−103−25	R110	CBN.F.R. 1/8W 10K
1−118−103−25	R111	CBN.F.R. 1/8W 10K
1−118−103−25	R112	CBN.F.R. 1/8W 10K
1−118−123−25	R113	CBN.F.R. 1/8W 12K
1−118−123−25	R114	CBN.F.R. 1/8W 12K
1−118−683−25	R115	CBN.F.R. 1/8W 68K
1−118−683−25	R116	CBN.F.R. 1/8W 68K
1−118−102−25	R117	CBN.F.R. 1/8W 1K
1−118−102−25	R118	CBN.F.R. 1/8W 1K
1−118−222−25	R119	CBN.F.R. 1/8W 2.2K
1−118−222−25	R120	CBN.F.R. 1/8W 2.2K
1−118−104−25	R121	CBN.F.R. 1/8W 100K
1−118−104−25	R122	CBN.F.R. 1/8W 100K
1−118−331−25	R123	CBN.F.R. 1/8W 330
1−118−331−25	R124	CBN.F.R. 1/8W 330
1−118−102−25	R125	CBN.F.R. 1/8W 1K
1−118−102−25	R126	CBN.F.R. 1/8W 1K
1−118−683−25	R127	CBN.F.R. 1/8W 68K
1−118−683−25	R128	CBN.F.R. 1/8W 68K
1−118−184−25	R129	CBN.F.R. 1/8W 180K
1−118−184−25	R130	CBN.F.R. 1/8W 180K
1−118−561−25	R131	CBN.F.R. 1/8W 560
1−118−561−25	R132	CBN.F.R. 1/8W 560
1−118−229−25	R133	CBN.F.R. 1/8W 2.2
1−118−229−25	R134	CBN.F.R. 1/8W 2.2

Part No.	Ref No.	Description
1−118−229−25	R135	CBN.F.R. 1/8W 2.2
1−118−229−25	R136	CBN.F.R. 1/8W 2.2
1−118−479−25	R137	CBN.F.R. 1/8W 4.7
1−118−479−25	R138	CBN.F.R. 1/8W 4.7
1−118−682−25	R139	CBN.F.R. 1/8W 6.8K
1−118−682−25	R140	CBN.F.R. 1/8W 6.8K
1−118−912−25	R141	CBN.F.R. 1/8W 9.1K
1−118−912−25	R142	CBN.F.R. 1/8W 9.1K
1−118−102−25	R143	CBN.F.R. 1/8W 1K
1−118−102−25	R144	CBN.F.R. 1/8W 1K
1−118−229−25	R145	CBN.F.R. 1/8W 2.2
1−118−229−25	R146	CBN.F.R. 1/8W 2.2
1−118−471−25	R147	CBN.F.R. 1/8W 470
1−118−471−25	R148	CBN.F.R. 1/8W 470
1−118−479−25	R149	CBN.F.R. 1/8W 4.7
1−118−479−25	R150	CBN.F.R. 1/8W 2.2
1−118−479−25	R151	CBN.F.R. 1/8W 2.2
1−118−229−25	R152	CBN.F.R. 1/8W 2.2
1−118−271−25	R153	CBN.F.R. 1/8W 270
1−118−271−25	R154	CBN.F.R. 1/8W 270
1−118−102−25	R155	CBN.F.R. 1/8W 1K
1−118−102−25	R156	CBN.F.R. 1/8W 1K
1−118−102−25	R157	CBN.F.R. 1/8W 1K
1−118−102−25	R158	CBN.F.R. 1/8W 1K
1−118−101−25	R159	CBN.F.R. 1/8W 100
1−118−101−25	R160	CBN.F.R. 1/8W 100
1−118−563−25	R161	CBN.F.R. 1/8W 56K
1−118−563−25	R162	CBN.F.R. 1/8W 56K
1−118−561−25	R163	CBN.F.R. 1/8W 560
1−118−561−25	R164	CBN.F.R. 1/8W 560
1−118−101−25	R165	CBN.F.R. 1/8W 100
1−118−101−25	R166	CBN.F.R. 1/8W 100
1−118−272−25	R167	CBN.F.R. 1/8W 2.7K
1−118−272−25	R168	CBN.F.R. 1/8W 2.7K
1−118−222−25	R169	CBN.F.R. 1/8W 2.2K
1−118−222−25	R170	CBN.F.R. 1/8W 2.2K
1−118−182−25	R171	CBN.F.R. 1/8W 1.8K
1−118−182−25	R172	CBN.F.R. 1/8W 1.8K
1−118−104−25	R173	CBN.F.R. 1/8W 100K
1−118−104−25	R174	CBN.F.R. 1/8W 100K
1−118−105−25	R175	CBN.F.R. 1/8W 1M
1−118−105−25	R176	CBN.F.R. 1/8W 1M
1−118−154−25	R177	CBN.F.R. 1/8W 150K
1−118−102−25	R178	CBN.F.R. 1/8W 1K
1−118−473−25	R179	CBN.F.R. 1/8W 47K
1−118−470−25	R180	CBN.F.R. 1/8W 47
1−118−392−25	R181	CBN.F.R. 1/8W 3.9K
1−118−392−25	R182	CBN.F.R. 1/8W 3.9K
1−118−151−25	R202	CBN.F.R. 1/8W 150
1−118−102−25	R203	CBN.F.R. 1/8W 1K
1−118−471−25	R204	CBN.F.R. 1/8W 470
1−118−103−25	R205	CBN.F.R. 1/8W 10K
1−118−103−25	R206	CBN.F.R. 1/8W 10K
1−118−471−25	R207	CBN.F.R. 1/8W 470
1−118−821−25	R208	CBN.F.R. 1/8W 820
1−118−561−25	R209	CBN.F.R. 1/8W 560

Part No.	Ref No.	Description
1-118-331-25	R210	CBN.F.R. 1/8W 330
1-118-331-25	R211	CBN.F.R. 1/8W 330
1-118-102-25	R212	CBN.F.R. 1/8W 1K
1-118-152-25	R213	CBN.F.R. 1/8W 1.5K
1-118-152-25	R214	CBN.F.R. 1/8W 1.5K
1-118-103-25	R215	CBN.F.R. 1/8W 10K
1-118-123-25	R216	CBN.F.R. 1/8W 12K
1-118-333-25	R219	CBN.F.R. 1/8W 33K
1-118-102-25	R220	CBN.F.R. 1/8W 1K
1-118-101-25	R221	CBN.F.R. 1/8W 100
1-118-182-25	R222	CBN.F.R. 1/8W 8.2K
1-118-101-25	R223	CBN.F.R. 1/8W 100
1-118-105-25	R224	CBN.F.R. 1/8W 1M
1-118-222-25	R225	CBN.F.R. 1/8W 2.2K
1-118-331-25	R226	CBN.F.R. 1/8W 330
1-118-331-25	R227	CBN.F.R. 1/8W 330
1-118-102-25	R228	CBN.F.R. 1/8W 1K
1-118-102-25	R229	CBN.F.R. 1/8W 1K
1-118-103-25	R230	CBN.F.R. 1/8W 10K
1-118-103-25	R231	CBN.F.R. 1/8W 10K
1-118-103-25	R232	CBN.F.R. 1/8W 10K
1-118-103-25	R233	CBN.F.R. 1/8W 10K
1-118-479-25	R270	CBN.F.R. 1/8W 4.7
1-118-479-25	R271	CBN.F.R. 1/8W 4.7
1-118-434-25	R301	CBN.F.R. 1/8W 430K
1-118-184-25	R302	CBN.F.R. 1/8W 180K
1-118-822-25	R303	CBN.F.R. 1/8W 8.2K
1-118-105-25	R304	CBN.F.R. 1/8W 1M
1-118-104-25	R305	CBN.F.R. 1/8W 100K
1-118-103-25	R306	CBN.F.R. 1/8W 10K
1-118-102-25	R307	CBN.F.R. 1/8W 1K
1-118-103-25	R308	CBN.F.R. 1/8W 10K
1-118-104-25	R309	CBN.F.R. 1/8W 100K
1-118-124-25	R310	CBN.F.R. 1/8W 120K
1-118-473-25	R311	CBN.F.R. 1/8W 47K
1-118-473-25	R312	CBN.F.R. 1/8W 47K
1-118-154-25	R313	CBN.F.R. 1/8W 150K
1-118-563-25	R314	CBN.F.R. 1/8W 56K
1-118-104-25	R315	CBN.F.R. 1/8W 100K
1-118-154-25	R316	CBN.F.R. 1/8W 150K
1-118-102-25	R317	CBN.F.R. 1/8W 1K
1-118-223-25	R318	CBN.F.R. 1/8W 22K
1-118-102-25	R319	CBN.F.R. 1/8W 1K
1-118-102-25	R320	CBN.F.R. 1/8W 1K
1-118-102-25	R321	CBN.F.R. 1/8W 1K
1-118-123-25	R322	CBN.F.R. 1/8W 12K
1-118-123-25	R323	CBN.F.R. 1/8W 12K
1-118-123-25	R324	CBN.F.R. 1/8W 12K
1-118-220-25	R325	CBN.F.R. 1/8W 22
1-118-820-25	R326	CBN.F.R. 1/8W 82
1-118-913-25	R327	CBN.F.R. 1/8W 91K
1-118-913-25	R328	CBN.F.R. 1/8W 91K
1-118-104-25	R329	CBN.F.R. 1/8W 100K
1-118-104-25	R330	CBN.F.R. 1/8W 100K
1-118-273-25	R401	CBN.F.R. 1/8W 27K
1-118-332-25	R402	CBN.F.R. 1/8W 3.3K
1-118-332-25	R403	CBN.F.R. 1/8W 3.3K
1-118-102-25	R404	CBN.F.R. 1/8W 1K
1-118-471-25	R409	CBN.F.R. 1/8W 470
1-118-471-25	R502	CBN.F.R. 1/8W 470
1-118-473-25	R505	CBN.F.R. 1/8W 47K
1-118-473-25	R506	CBN.F.R. 1/8W 47K
1-118-102-25	R508	CBN.F.R. 1/8W 1K
1-118-102-25	R510	CBN.F.R. 1/8W 1K
1-118-221-25	R511	CBN.F.R. 1/8W 220
1-118-101-25	R513	CBN.F.R. 1/8W 100
1-118-391-25	R514	CBN.F.R. 1/8W 390
1-118-473-25	R522	CBN.F.R. 1/8W 47K
1-118-473-25	R523	CBN.F.R. 1/8W 47K
1-118-473-25	R524	CBN.F.R. 1/8W 47K
1-141-180-23	R801	METAL R. 1W 18
1-118-103-25	R802	CBN.F.R. 1/8W 10K
1-118-331-25	R803	CBN.F.R. 1/8W 330
1-118-101-25	R903	CBN.F.R. 1/8W 100
1-118-152-25	R904	CBN.F.R. 1/8W 1.5K

INTEGRATED CIRCUITS

2-441-480-51-1	IC101	MN6474M, D/AC. MATU.
2-441-723-74-1	IC102	LTV817/PC817 PHOTOCOUPLER IC
2-441-218-71	IC201	MC7805, 1A, +5V Regulator
2-441-259-71	IC301	KA9220, SSP, SAMSUNG
2-441-520-41-1	IC302	NJM4558D/MC4558C OP-AMP
2-441-261-71	IC303	KA9258, 4ch BTL DRIVER
2-441-260-71	IC401	KS9282, DSP, SAMSUNG
2-660-193-01-1	IC501	LE1072. CXP82716, CPU
2-442-850-31	IC502	GD74HC02, NOR GATE, TTI.

TRANSISTORS

2-404-111-35-1	Q101	2SK246GR, FET
2-404-111-35-1	Q102	2SK246GR, FET
2-402-130-35	Q103	KTC3199/2SC3199GR, RF/AF
2-402-130-35	Q104	KTC3199/2SC3199GR, RF/AF
2-400-127-35	Q105	KTA1267/2SA1267GR, RF/AF
2-400-127-35	Q106	KTA1267/2SA1267GR, RF/AF
2-402-130-35	Q107	KTC3199/2SC3199GR, RF/AF
2-402-130-35	Q108	KTC3199/2SC3199GR, RF/AF
2-400-127-35	Q109	KTA1267/2SA1267GR, RF/AF
2-400-127-35	Q110	KTA1267/2SA1267GR, RF/AF
2-400-127-35	Q111	KTA1267/2SA1267GR, RF/AF
2-400-127-35	Q112	KTA1267/2SA1267GR, RF/AF
2-402-130-35	Q113	KTC3199/2SC3199GR, RF/AF
2-402-130-35	Q114	KTC3199/2SC3199GR, RF/AF
2-404-111-35-1	Q115	2SK246GR, FET
2-404-111-35-1	Q116	2SK246GR, FET
2-400-127-35	Q117	KTA1267/2SA1267GR, RF/AF
2-400-127-35	Q118	KTA1267/2SA1267GR, RF/AF
2-402-130-35	Q119	KTC3199/2SC3199GR, RF/AF
2-402-130-35	Q120	KTC3199/2SC3199GR, RF/AF
2-402-127-25	Q121	2SC2878B, RF/SW
2-402-127-25	Q122	2SC2878B, RF/SW
2-402-127-25	Q123	2SC2878B, RF/SW
2-402-127-25	Q124	2SC2878B, RF/SW
2-406-109-15	Q125	KSR1003, SWITCHING
2-406-107-15	Q126	KSR2001, SWITCHING
2-406-106-15	Q127	KRA103M/KRA2203
2-406-106-15	Q130	KRA103M/KRA2203

Part No.	Ref No.	Description
2-402-111-25	Q201	KTC3198/KTC1815Y, AF
2-400-118-35	Q202	KTA1266/KTA1015GR, AF
⚠ 2-401-112-21	Q203	KTB1366/KTB1015Y
2-402-111-25	Q204	KTC3198/KTC1815Y, AF
2-400-118-35	Q205	KTA1266/KTA1015GR, AF
2-400-118-35	Q206	KTA1266/KTA1015GR, AF
⚠ 2-406-124-25	Q207	2SD1207T, SANYO
2-400-118-25	Q208	KTA1266/KTA1015GR, AF
2-402-111-25	Q209	KTC3198/KTC1815Y, AF
2-400-118-35	Q210	KTA1266/KTA1015GR, AF
2-400-108-25	Q301	KTA1271/KTA950Y
2-402-114-25	Q302	KTC3203/KTC2120Y, PA
2-400-108-25	Q303	KTA1271/KTA950Y
2-402-111-25	Q501	KTC3198/KTC1815Y, AF
2-402-111-25	Q901	KTC3198/KTC1815Y, AF
2-406-109-15	Q902	KSR1003, SWITCHING

DIODES

2-414-299-95	D102	1N4148M/1SS133, VRM=75V
2-414-299-95	D103	1N4148M/1SS133, VRM=75V
2-414-299-95	D201	1N4148M/1SS133, VRM=75V
2-414-299-95	D202	1N4148M/1SS133, VRM=75V
2-414-299-95	D203	1N4148M/1SS133, VRM=75V
2-414-299-95	D204	1N4148M/1SS133, VRM=75V
2-414-299-95	D205	1N4148M/1SS133, VRM=75V
2-414-299-95	D206	1N4148M/1SS133, VRM=75V
2-414-299-95	D207	1N4148M/1SS133, VRM=75V
2-414-299-95	D208	1N4148M/1SS133, VRM=75V
2-414-299-95	D209	1N4148M/1SS133, VRM=75V
⚠ 2-421-047-35	D210	UZ4.7B/1N750A, 4.7V/400
⚠ 2-421-110-35	D211	UZ11BM/1N962B, 11V/400
⚠ 2-421-160-35	D212	UZ16BM/1N966B, 16V/40C
⚠ 2-421-051-35	D213	UZ5.1B/1N751A, 5.1V/400
⚠ 2-421-180-35	D214	UZ18BM/1N967B, 18V/400
⚠ 2-421-062-45	D215	UZ6.2BM/1N753A, 6.2V/400
⚠ 2-413-571-65	D216	1N4002L, 1A/100V, LITE-ON
⚠ 2-413-571-65	D217	1N4002L, 1A/100V, LITE-ON
⚠ 2-413-571-65	D218	1N4002L, 1A/100V, LITE-ON
⚠ 2-413-571-65	D219	1N4002L, 1A/100V, LITE-ON
⚠ 2-413-571-65	D221	1N4002L, 1A/100V, LITE-ON
⚠ 2-413-571-65	D222	1N4002L, 1A/100V, LITE-ON
⚠ 2-413-571-65	D223	1N4002L, 1A/100V, LITE-ON
⚠ 2-413-571-65	D224	1N4002L, 1A/100V, LITE-ON
⚠ 2-413-571-65	D225	1N4002L, 1A/100V, LITE-ON
2-414-299-95	D301	1N4148M/1SS133, VRM=75V
2-414-299-95	D501	1N4148M/1SS133, VRM=75V
⚠ 2-421-043-35	D901	UZ4.3B/1N749A, 4.3V/400

CRYSTALS

2-138-181-01	X101	33.8688MHz
2-138-368-01-1	X501	CST8.46MTW, MURATA

SEMI FIXED RESISTORS

2-512-203-01-1	VR301	20K, NVZ(G)6TL1B
2-512-203-01-1	VR302	20K, NVZ(G)6TL1B
2-512-203-01-1	VR303	20K, NVZ(G)6TL1B
2-512-203-01-1	VR304	20K, NVZ(G)6TL1B

WAFERS

2-168-122-01	WA301	NKC-022-0, 3P, P=2.5
2-168-107-01	WA302	GILS-8P-S2T2-2F, 8P, P=2
2-168-501-01	WA303	53014-0810, 8P, P=2
2-168-499-01	WA304	53014-0610, 6P, P=2
2-168-124-01	WA305	NICC-024-0, 5P, P=2.5
2-168-307-01	WA501	CARD CABLE, 30P, VERTICAL
2-168-499-01	WA502	53014-0610, 6P, P=2
2-168-499-01	WA601	53014-0610, 6P, P=2
2-168-526-01	WA602	5267-05A, 5P, P=2.5

FILTERS

2-138-623-01	B18	BFS3530AOS, BEAD FILTER
2-138-623-01	B901	BFS3530AOS, BEAD FILTER
2-138-623-01	B902	BFS3530AOS, BEAD FILTER
2-138-623-01	B903	BFS3530AOS, BEAD FILTER
2-138-623-01	B904	BFS3530AOS, BEAD FILTER
2-138-623-01	B905	BFS3530AOS, BEAD FILTER
2-138-623-01	B906	BFS3530AOS, BEAD FILTER
2-138-623-01	B907	BFS3530AOS, BEAD FILTER
2-138-623-01	B908	BFS3530AOS, BEAD FILTER
2-138-623-01	B909	BFS3530AOS, BEAD FILTER
2-138-623-01	B910	BFS3530AOS, BEAD FILTER
2-138-623-01	B407	BFS3530AOS, BEAD FILTER
2-138-623-01	B408	BFS3530AOS, BEAD FILTER

JACKS

2-155-663-01	JAC101	RCA2P, JW1609R, RCA JACK
2-155-675-01	JAC102	HTJ-035-12/LGY6501-0600
2-155-675-01	JAC103	HTJ-035-12/LGY6501-0600
2-155-674-01	JAC5011	1P, PINK JACK

MISCELLANEOUS

⚠ 2-170-936-07		247X247, MAIN
⚠ 3-327-032-02	HEA201	AL(L=40)HEAT SINK, PIN T.Y.
⚠ 3-327-032-02	HEA203	AL(L=40)HEAT SINK, PIN T.Y.
2-159-849-01	CN910	2P, L=150, AWG22
2-159-8A4-01		1P, L=80, Φ3.5
2-159-8A4-01		1P, L=80, Φ3.5
1-038-100-35	L301	10uH, AL-02, FIXED INDUCTOR

PCB-2 CONTROL P.C.BOARD

RESISTORS

1-118-151-25	R501	CBN.F.R. 1/8W 150
1-118-473-25	R502	CBN.F.R. 1/8W 47K
1-118-151-25	R503	CBN.F.R. 1/8W 47K
1-118-151-25	R504	CBN.F.R. 1/8W 47K
1-118-151-25	R505	CBN.F.R. 1/8W 47K
1-118-151-25	R506	CBN.F.R. 1/8W 150

DIODES

2-414-299-95	D501	1N4148M/1SS133, VRM=75V
2-414-299-95	D502	1N4148M/1SS133, VRM=75V
2-414-299-95	D503	1N4148M/1SS133, VRM=75V
2-414-299-95	D504	1N4148M/1SS133, VRM=75V

SWITCHES

2-208-157-01	SW501	KTP-1115AM, 2P, 5MM
2-208-157-01	SW502	KTP-1115AM, 2P, 5MM
2-208-157-01	SW503	KTP-1115AM, 2P, 5MM
2-208-157-01	SW504	KTP-1115AM, 2P, 5MM
2-208-157-01	SW505	KTP-1115AM, 2P, 5MM
2-208-157-01	SW506	KTP-1115AM, 2P, 5MM
2-208-157-01	SW507	KTP-1115AM, 2P, 5MM

Part No.	Ref No.	Description
2-208-157-01	SW508	KTP-1115AM, 2P, 5MM
2-208-157-01	SW509	KTP-1115AM, 2P, 5MM
2-208-157-01	SW510	KTP-1115AM, 2P, 5MM
2-208-157-01	SW511	KTP-1115AM, 2P, 5MM
2-208-157-01	SW512	KTP-1115AM, 2P, 5MM
2-208-157-01	SW513	KTP-1115AM, 2P, 5MM
2-208-157-01	SW514	KTP-1115AM, 2P, 5MM
2-208-157-01	SW515	KTP-1115AM, 2P, 5MM

MISCELLANEOUS

2-143-267-01	FLT	CM1438D, 39. 2X116. 7
2-168-289-01	WA501	FPC CONNECTOR
2-159-710-01		30P, 150MM, CARD CABLE
2-125-817-02	RMC501	DG-L2/SBX 1610-02, MODULE
2-419-963-31	LED501	2COLOR LED, SPR39MVW3
1-340-214-01	RA501	47KX6, ARRAY RESISTOR
1-340-214-01	RA502	47KX6, ARRAY RESISTOR
1-340-214-01	RA503	47KX6, ARRAY RESISTOR
1-340-214-01	RA504	47KX6, ARRAY RESISTOR
2-159-7F8-01	WA501	6P, P=2, L=120, CONN. ASS'Y
3-827-706-01		CUSHION, SBR BLACK
2-170-935-05		PCB, 330X247

PCB-3 HEADPHONE P.C.BOARD

RESISTORS

1-118-103-25	R603	CBN.F.R. 1/8W 10K
1-118-103-25	R604	CBN.F.R. 1/8W 10K
1-118-102-25	R605	CBN.F.R. 1/8W 1K
1-118-102-25	R606	CBN.F.R. 1/8W 1K
1-118-101-25	R607	CBN.F.R. 1/8W 100
1-118-101-25	R608	CBN.F.R. 1/8W 100
1-118-472-25	R609	CBN.F.R. 1/8W 4.7K
1-118-472-25	R610	CBN.F.R. 1/8W 4.7K
1-118-104-25	R611	CBN.F.R. 1/8W 100K
1-118-104-25	R612	CBN.F.R. 1/8W 100K

INTEGRATED CIRCUITS

2-441-520-41-1	IC601	NJM4558D/MC4558C, OP-AMP
2-441-520-41-1	IC602	NJM4558D/MC4558C, OP-AMP

MISCELLANEOUS

2-501-342-01-1	VR601	VOLUME, 50KB, RK09K02A
2-155-599-01-1	JAC601	JACK, 3P, LGR4502-5000
2-159-7XO-01	CN601	6P, P=2, L=250, CONN. ASS'Y

PCB-4 POWER P.C.BOARD

TRANSFORMERS

⚠ 2-131-577-01	P.T.	120V/60Hz, AC10VX2 BK
⚠ 2-131-578-01	P.T.	230V/50Hz, AC10VX2 IB I

WAFERS

⚠ 2-168-459-01	WA503	2P, P=7.96 BK
⚠ 2-168-574-01	WA503	2P, P=7.96 IB I

MISCELLANEOUS

⚠ 1-998-101-07	C710	0.01uF/250V CAPACITOR
⚠ 2-999-114-01	FU701	HOLDER, FUSE
⚠ 2-159-7X1-01	CN701	5P, P=2.5, L=100, CONN. ASS'Y

Part No.	Ref No.	Description
⚠ 2-188-651-01	FU701	200mA/250V, UL/CSA. 51T BK LONG TIME-DELAY
⚠ 2-188-656-01	FU701	125L/250V, SEMKO, 51T IB I LONG TIME-DELAY

CHASISS MISCELLANEOUS

2-159-7V5-01		1P, L=120, CONN, ASS'Y
⚠ 2-211-139-01		POWER CORD SPT2, WAFER TYPE, BK
⚠ 2-211-139-01		POWER CORD 2.5A/250V, IB I
⚠ 8-201-120-01		BUSHING, STRAIN, KIFCO 2271
3-810-807-01		LABEL(CAUTION 2)
3-810-808-01		LABEL(CAUTION 3)
3-810-809-01		LABEL(CAUTION 1)
8-179-134-01		LABEL SERIAL NUMBER
2-159-7V3-01	WA302	8P, SHIELD
2-159-7G0-01	WA303	8P
2-159-7F9-01	WA304	6P, FLAT

PACKING PARTS LIST

3-827-714-01	OWNER'S MANUAL
3-827-716-01	PAD, SIDE
3-812-725-01	POLY SHEET
3-327-910-01	COVER, POLY
3-219-009-01	BAG, POLY
3-167-103-01	PLUG WIRE(AUDIO OUTPUT)
A-287-7EO-01	REMOTE CONTROL
2-154-203-01	BATTERY ASS'Y AAM
2-158-216-01	PIN CORDX2EA(RMC IN/OUT)
2-212-131-01	COAXIAL CABLE(DIGITAL OUT)
3-327-106-01	CARD, WARRANTY BK
3-327-108-02	CARD, POST BK
3-327-108-01	CARD, SAFEGUARDS BK
3-827-717-01	LABEL, BARCODE

ABBREVIATIONS IN PARTS LIST

CAPACITORS

ELEC. : ELECTROLYTIC
CERA. : CERAMIC
POLY.P. : POLYPROPYLENE
CEA : ALUMINUM ELECTROLYTIC CAPACITORS

RESISTORS

CEN : CABON — 10K : 10Kohm
MTL : METAL — 2.2 : 2.2ohm

TRANSISTORS

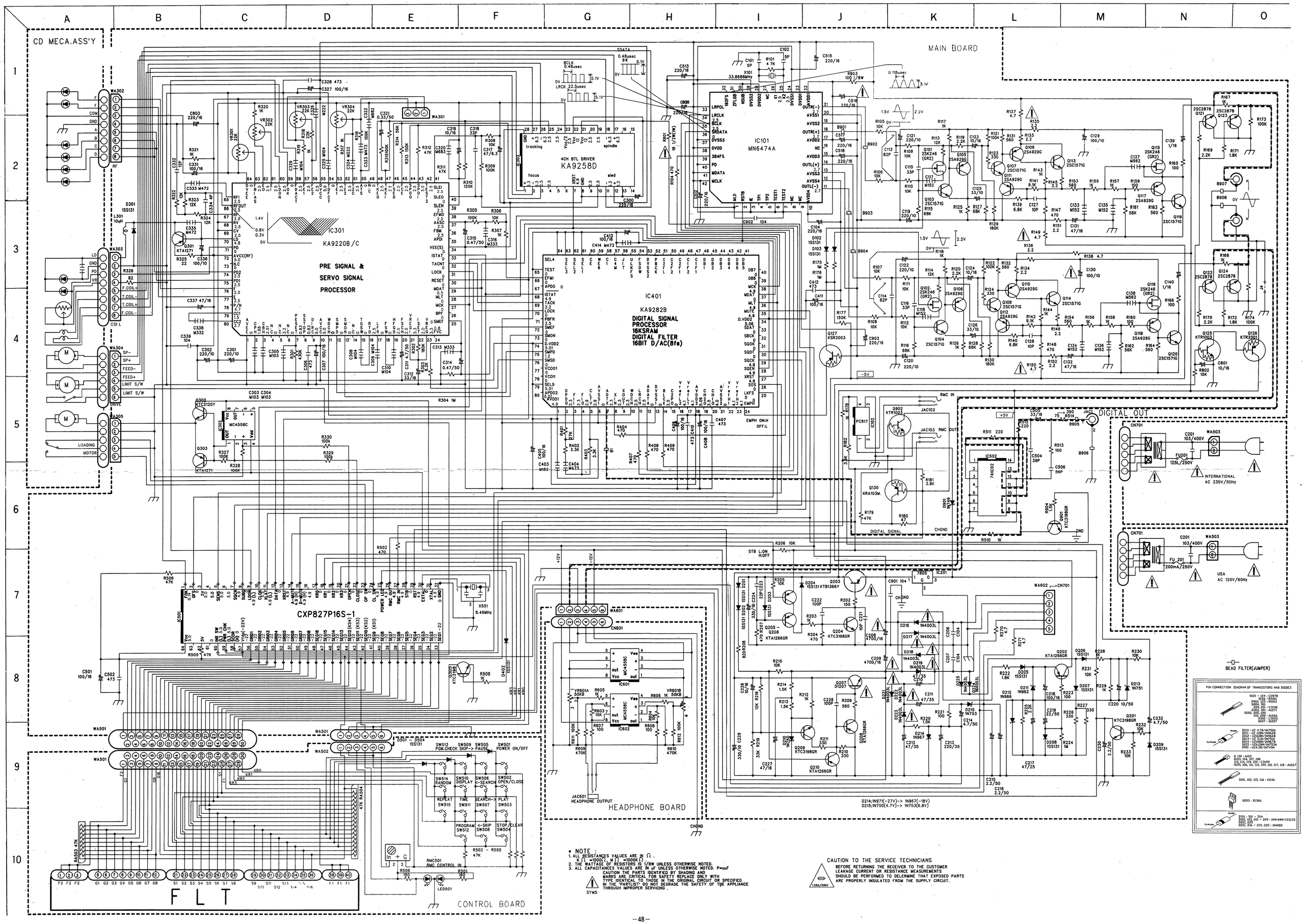
FET : FIELD EFFECT TRANSISTOR

CONTROLS

RES.SEMI FIX : SEMI-FIXED RESISTOR

NOTE

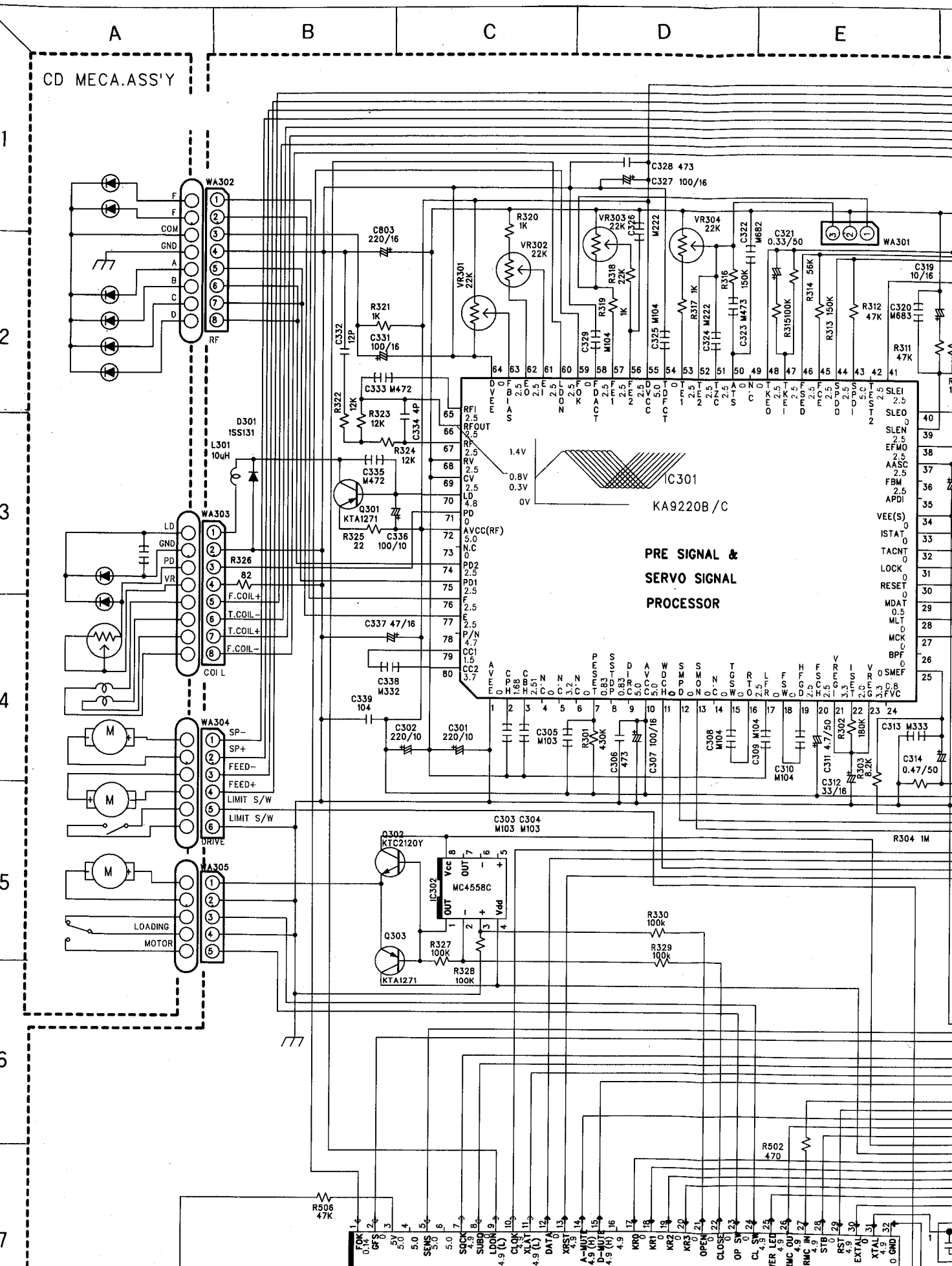
⚠ SAFETY RELATED COMPONENT. USE ONLY EXACT REPLACEMENT PART AS SPECIFIED.



* NOTE :
1. ALL RESISTANCES VALUES ARE IN Ω .
   K Ω =1000Ω, M Ω =1000K Ω
2. THE WATTAGE OF RESISTORS IS 1/8W UNLESS OTHERWISE NOTED.
3. ALL CAPACITANCES VALUES ARE IN uF UNLESS NOTICED. P=uuF

CAUTION THE PARTS IDENTIFIED BY SHADING AND MARKS ARE CRITICAL FOR SAFETY REPLACE ONLY WITH TYPE IDENTICAL TO THOSE IN THE ORIGINAL CIRCUIT OR SPECIFIED IN THE PARTLIST. DO NOT DEGRADE THE SAFETY OF THE APPLIANCE THROUGH IMPROPER SERVICING .

SYM5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CD MECA.ASS'Y
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T.COIL+
F.COIL-
COIL
WA304
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FEED+
LIMIT S/W
LIMIT S/W
DRIVE
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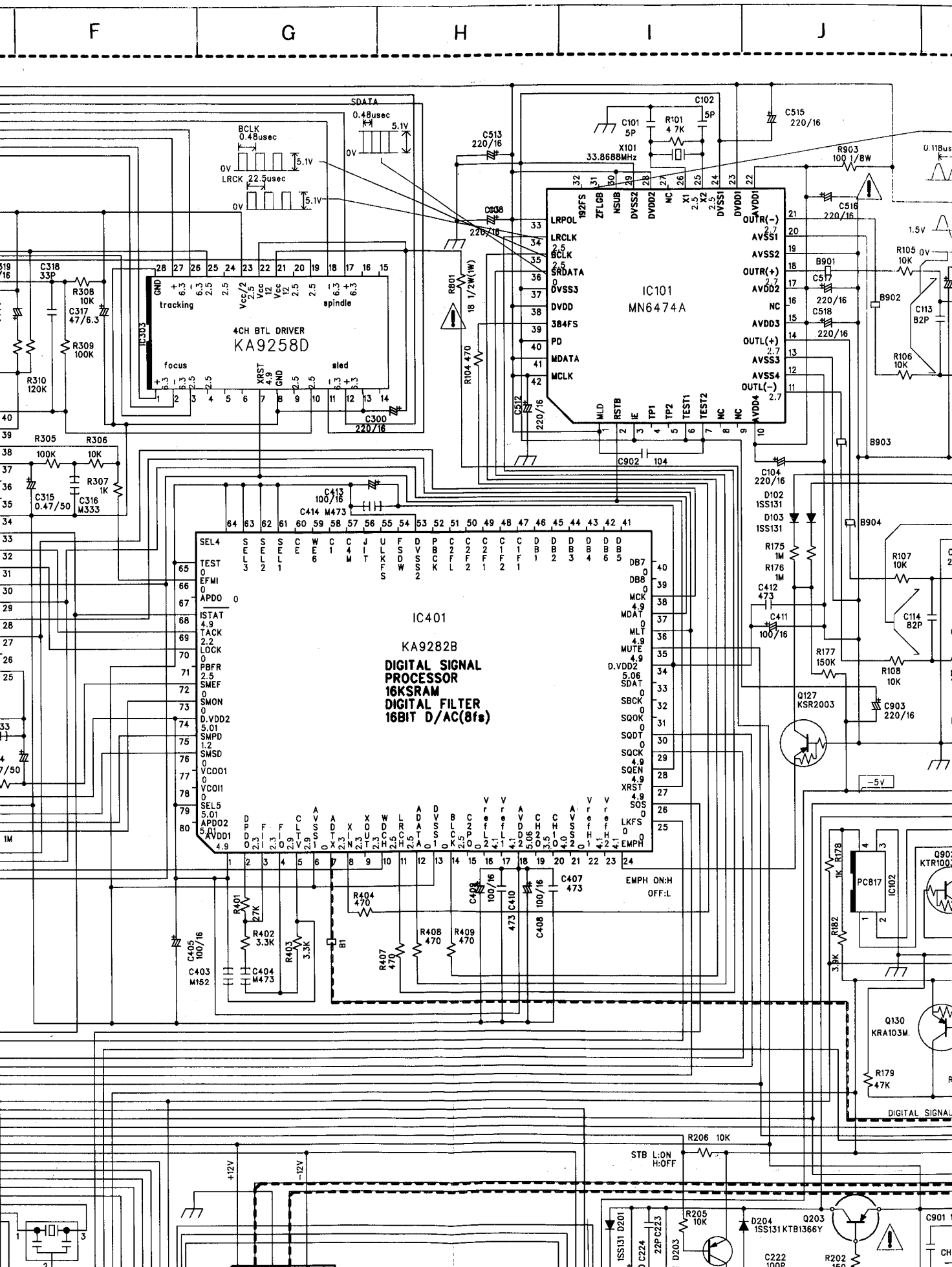
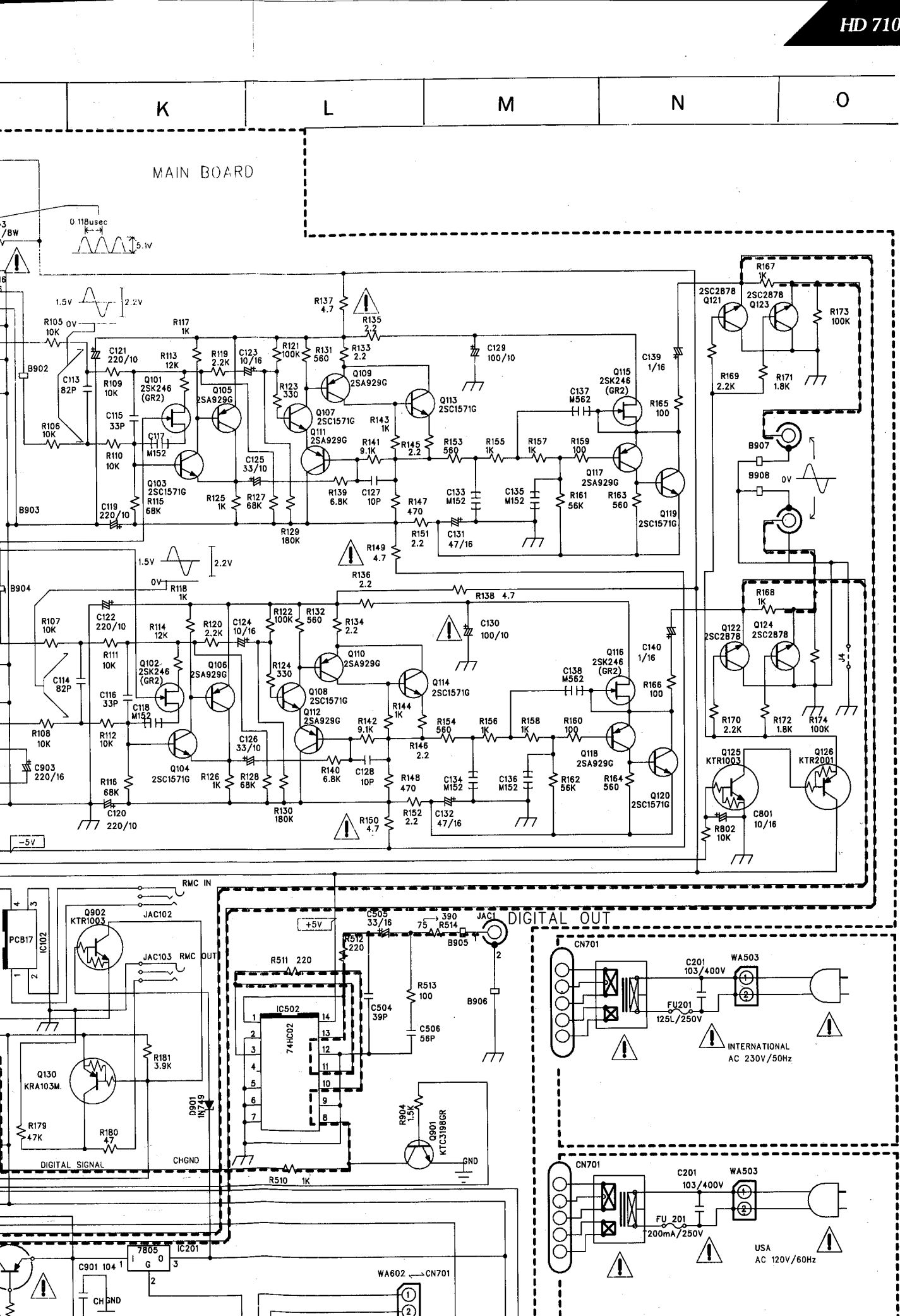
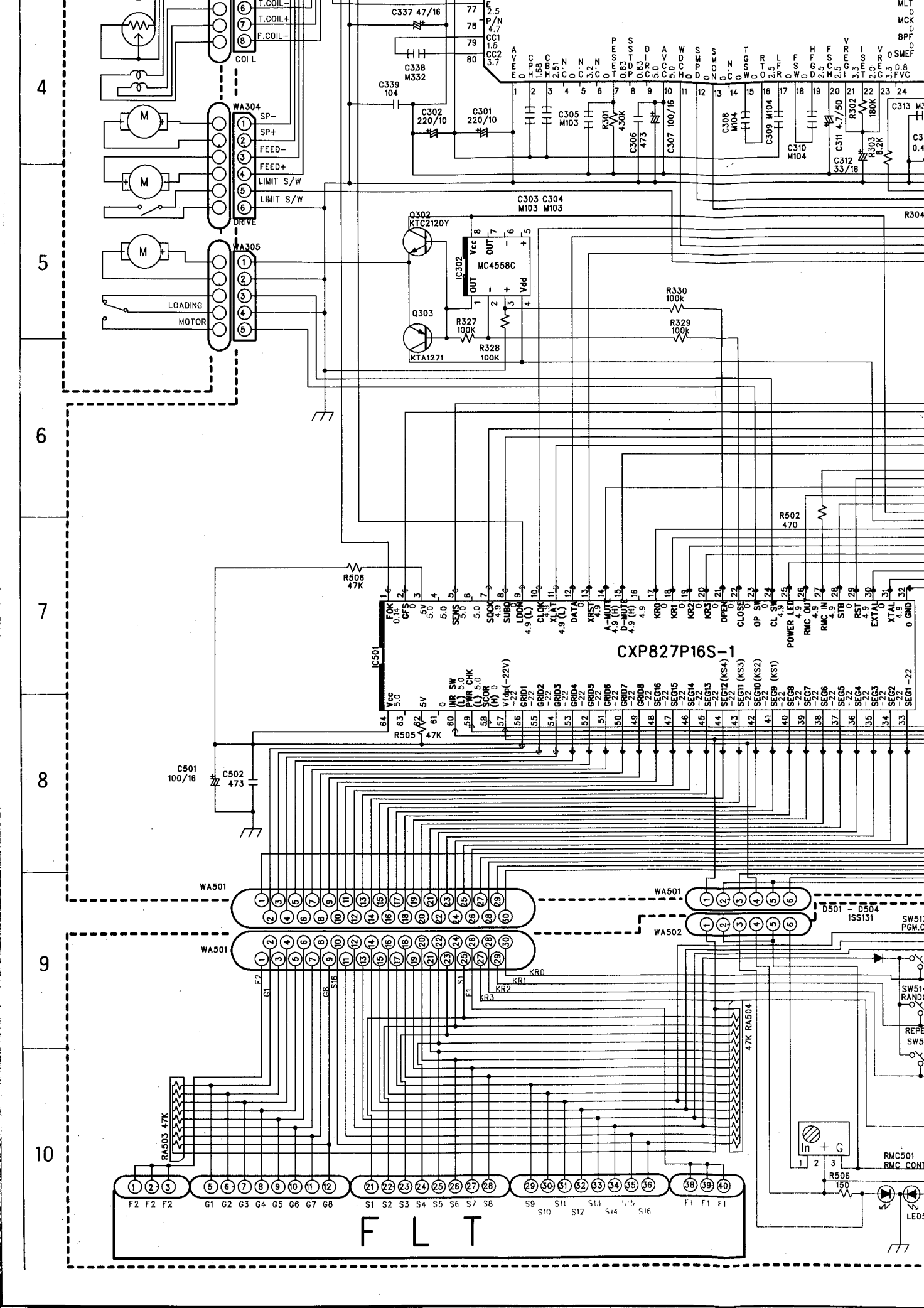
LOADING
MOTOR
WA301
D301
1SS131
L301
10uH
R326
82
C803
220/16
C328 473
C327 100/16
R320
1K
VR303
22K
VR304
22K
VR302
22K
VR301
22K
C326
M222
C322
M682
C321
0.33/50
R321
1K
C332
12P
C331
100/16
R322
12K
C333 M472
R323
12K
C334
4P
R324
12K
C335
M472
Q301
KTA1271
R325
22
C336
100/10
C337 47/16
C338
M332
C339
104
C302
220/10
C301
220/10
C305
M103
R301
430K
C306
473
C307 100/16
C308
M104
C309 M104
C310
M104
C311 4.7/50
R302
180K
R303
8.2K
C312
33/16
C313 M333
C314
0.47/50
R304 1M
C303 C304
M103 M103
Q302
KTC2120Y
IC302
MC4558C
Vcc
OUT
Vdd
Q303
KTA1271
R327
100K
R328
100K
R330
100k
R329
100k
R318
22K
R319
1K
R317
1K
R316
22K
R315
100K
R314
56K
R313
150K
R312
47K
C319
10/16
C320
M683
R311
47K
C325 M104
C324 M222
C323 M473
150K
C329
M104
1.4V
0.8V
0.3V
0V
IC301
KA9220B/C
PRE SIGNAL &
SERVO SIGNAL
PROCESSOR
R502
470
R506
47K
FOK
GFS
SENS
SQCK
SUBQ
LDON
CLOK
XLAT
DATA
XRST
A-MUT
D-MUT
KR0
KR1
KR2
KR3
OPEN
CLOSE
OP SW
CL SW
LOADER LED
RMC OUT
RMC IN
STB
RST
XTAL
GND

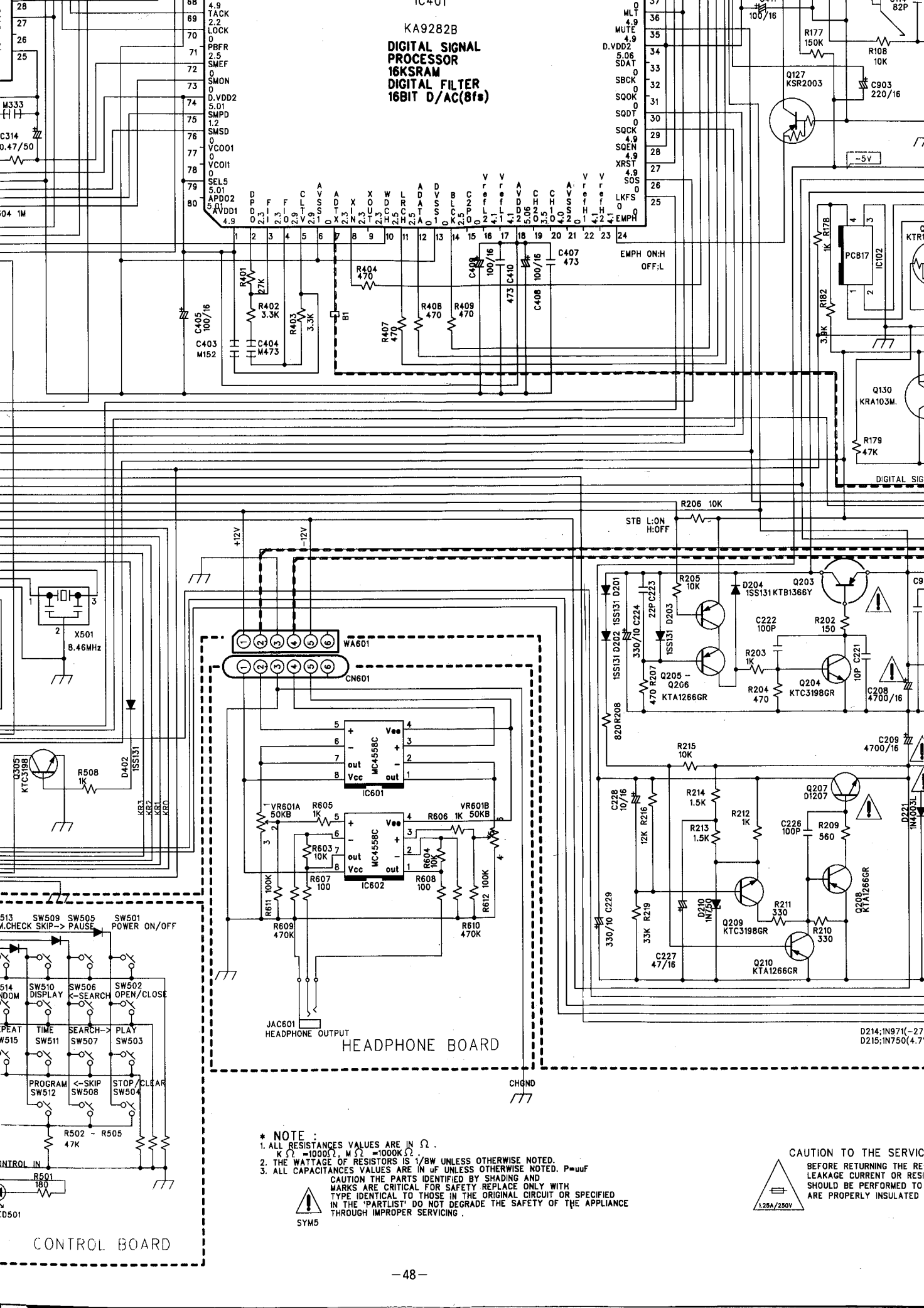

F
G
H
I
J
IC101
MN6474A
IC303
4CH BTL DRIVER
KA9258D
tracking
focus
spindle
sled
IC401
KA9282B
DIGITAL SIGNAL
PROCESSOR
16KSRAM
DIGITAL FILTER
16BIT D/AC(8fs)
X101
33.8688MHz
BCLK
0.48usec
LRCK 22.5usec
SDATA
0.48usec
5.1V
0V
EMPH ON:H
OFF:L
STB L:ON
H:OFF
PC817
IC102
Q127
KSR2003
Q130
KRA103M.
Q203
KTB1366Y
D204
1SS131
D102
1SS131
D103
1SS131
-5V
+12V
-12V
DIGITAL SIGNAL

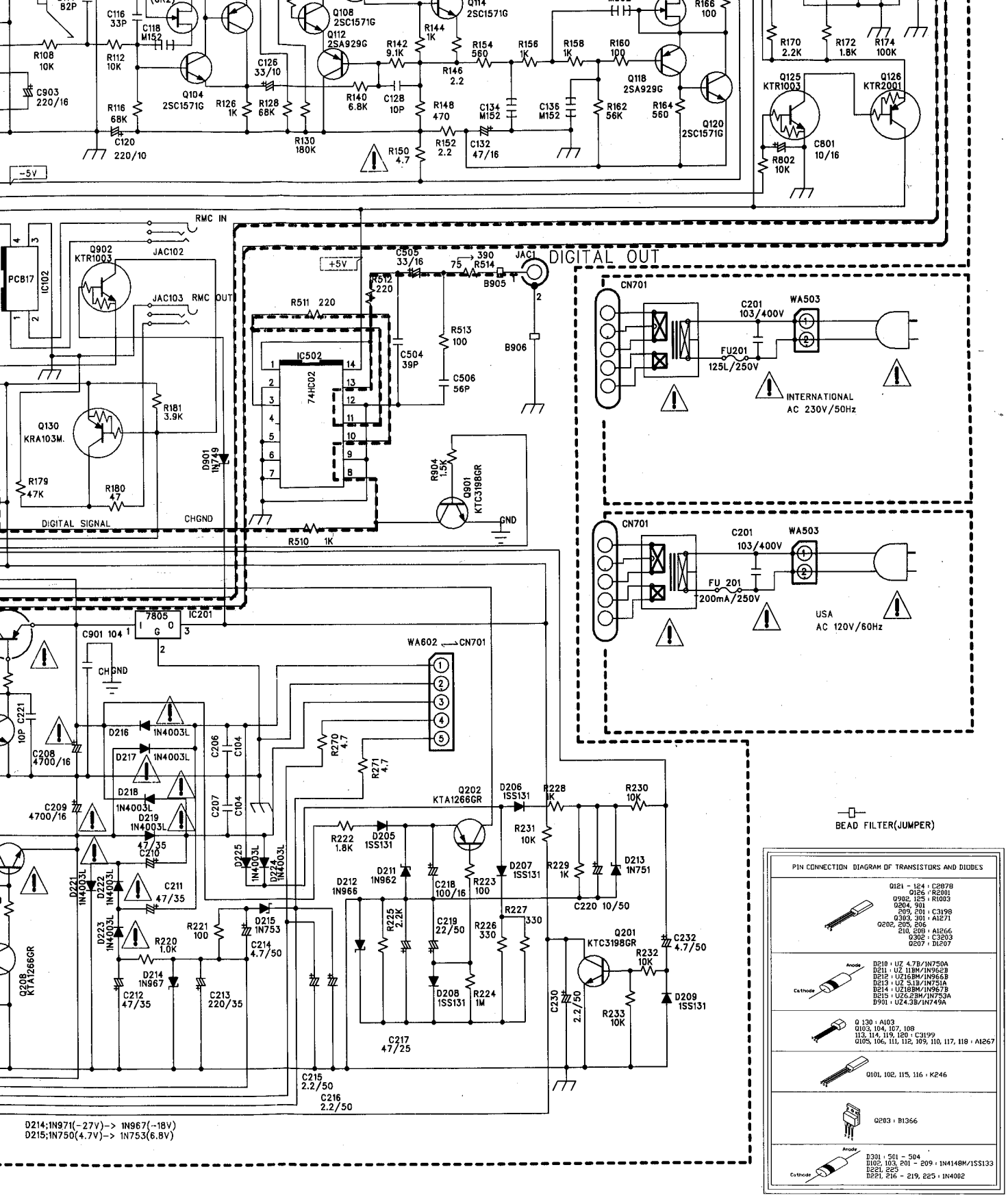
K L M N O

MAIN BOARD




WA304
SP-
SP+
FEED-
FEED+
LIMIT S/W
LIMIT S/W
DRIVE
COIL
T.COIL-
T.COIL+
F.COIL-
WA305
LOADING
MOTOR
C337 47/16
C338 M332
C339 104
C302 220/10
C301 220/10
C303 C304 M103 M103
Q302 KTC2120Y
Q303 KTA1271
IC302 MC4558C
R327 100K
R328 100K
R330 100k
R329 100k
R301 4.30K
C305 M103
C306 473
C307 100/16
C308 M104
C309 M104
C310 M104
C311 4.7/50
C312 33/16
R302 180K
R303 8.2K
R304
R502 470
R506 47K
IC501
CXP827P16S-1
R505 47K
C501 100/16
C502 473
WA501
WA502
D501 – D504 1SS131
SW513 PGM.C
SW514 RANDO
REPE SW5
RA503 47K
RA504 47K
KR0
KR1
KR2
KR3
RMC501 RMC CONT
R506 150
LED5
F L T

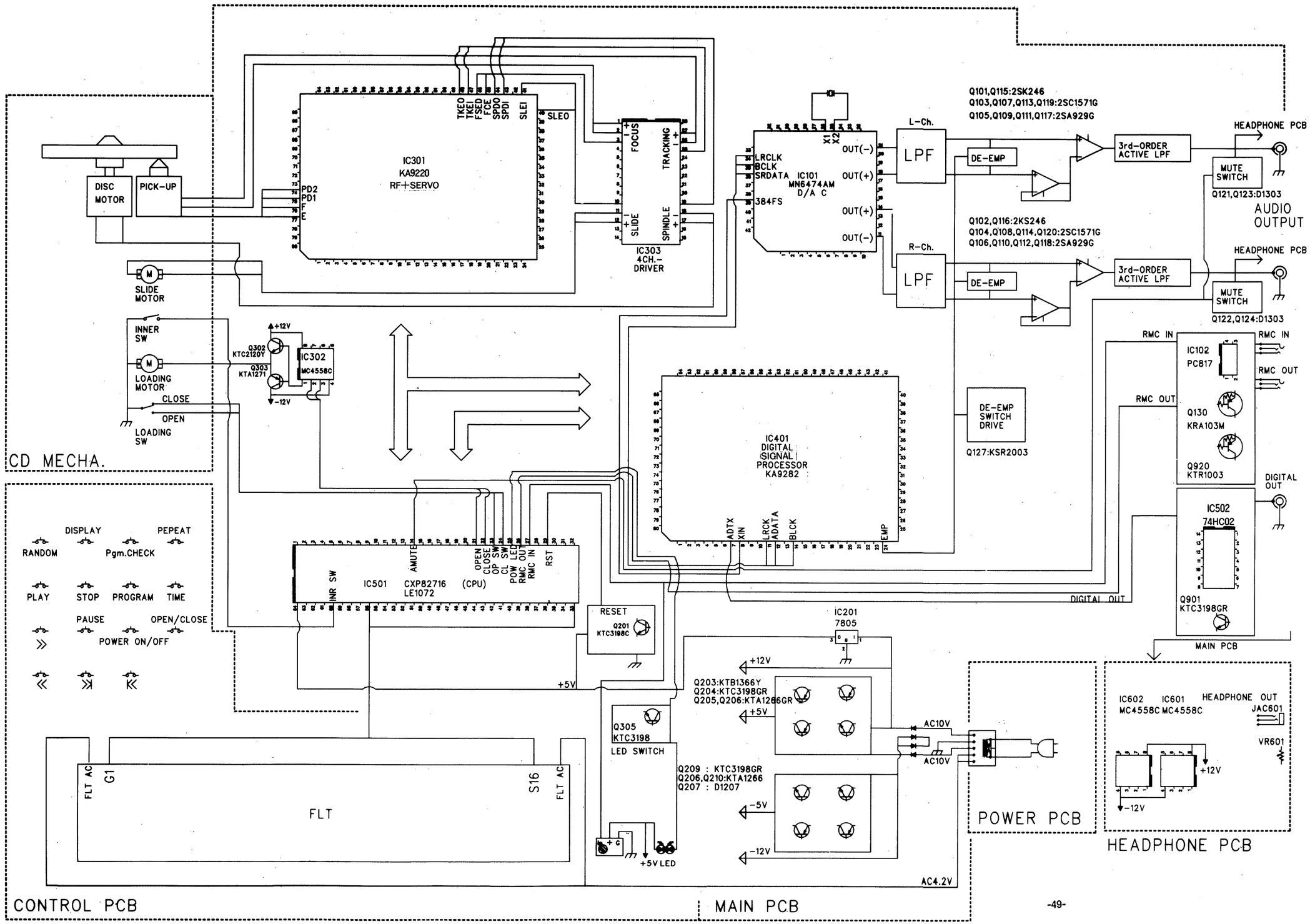

IC401
KA9282B
DIGITAL SIGNAL PROCESSOR
16KSRAM
DIGITAL FILTER
16BIT D/AC(8fs)
EMPH ON:H
OFF:L
X501
8.46MHz
WA601
CN601
IC601
IC602
MC4558C
VR601A 50KB
VR601B 50KB
JAC601
HEADPHONE OUTPUT
HEADPHONE BOARD
CHGND
STB L:ON
H:OFF
R206 10K
Q203
Q205 - Q206 KTA1266GR
Q204 KTC3198GR
Q207 D1207
Q208 KTA1266GR
Q209 KTC3198GR
Q210 KTA1266GR
Q127 KSR2003
Q130 KRA103M.
PC817
IC102
-5V
SW501 POWER ON/OFF
SW502 OPEN/CLOSE
SW503 PLAY
SW504 STOP/CLEAR
SW505 PAUSE
SW506 <-SEARCH
SW507 SEARCH->
SW508 <-SKIP
SW509 SKIP->
SW510 DISPLAY
SW511 TIME
SW512 PROGRAM
R502 - R505 47K
CONTROL BOARD
* NOTE :
1. ALL RESISTANCES VALUES ARE IN Ω .
K Ω =1000Ω, M Ω =1000K Ω .
2. THE WATTAGE OF RESISTORS IS 1/8W UNLESS OTHERWISE NOTED.
3. ALL CAPACITANCES VALUES ARE IN uF UNLESS OTHERWISE NOTED. P=uuF
CAUTION THE PARTS IDENTIFIED BY SHADING AND MARKS ARE CRITICAL FOR SAFETY REPLACE ONLY WITH TYPE IDENTICAL TO THOSE IN THE ORIGINAL CIRCUIT OR SPECIFIED IN THE 'PARTLIST' DO NOT DEGRADE THE SAFETY OF THE APPLIANCE THROUGH IMPROPER SERVICING .
SYM5
CAUTION TO THE SERVIC
BEFORE RETURNING THE RE
LEAKAGE CURRENT OR RESI
SHOULD BE PERFORMED TO
ARE PROPERLY INSULATED
1.25A/250V
D214;1N971(-27
D215;1N750(4.7



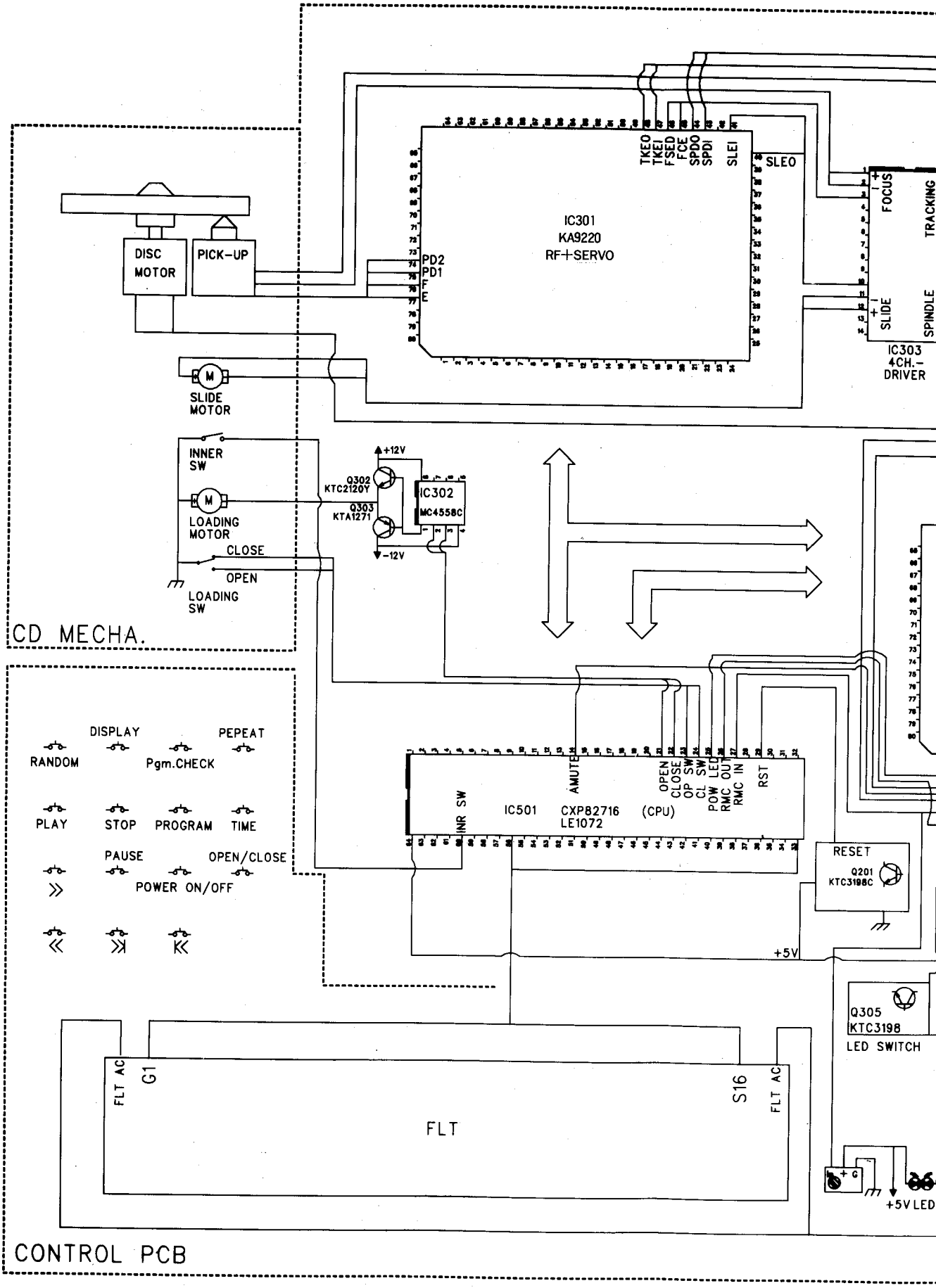
TO THE SERVICE TECHNICIANS

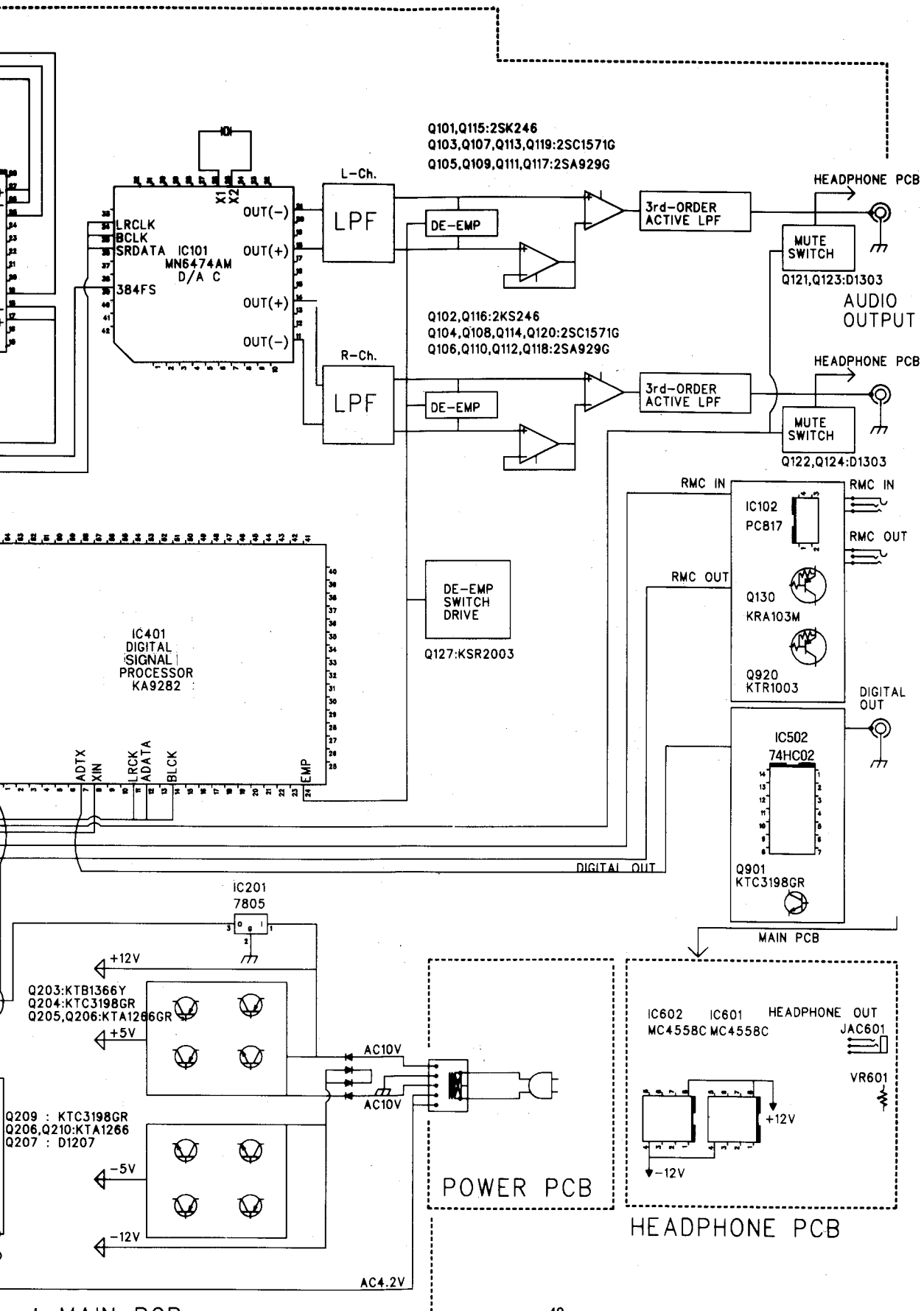
RETURNING THE RECEIVER TO THE CUSTOMER
E CURRENT OR RESISTANCE MEASUREMENTS
BE PERFORMED TO DELERMINE THAT EXPOSED PARTS
ROPERLY INSULATED FROM THE SUPPLY CIRCUIT.

BLOCK DIAGRAM

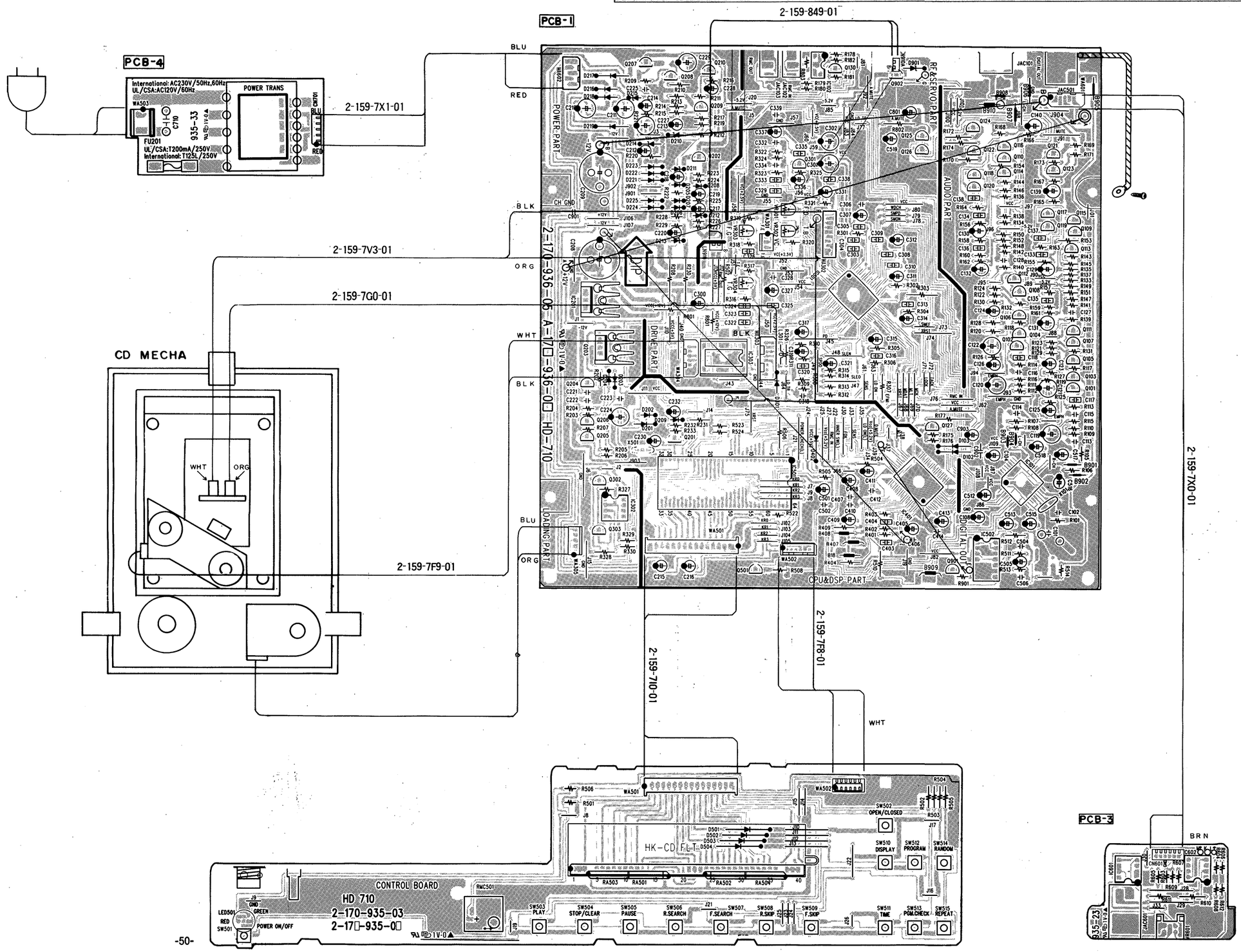


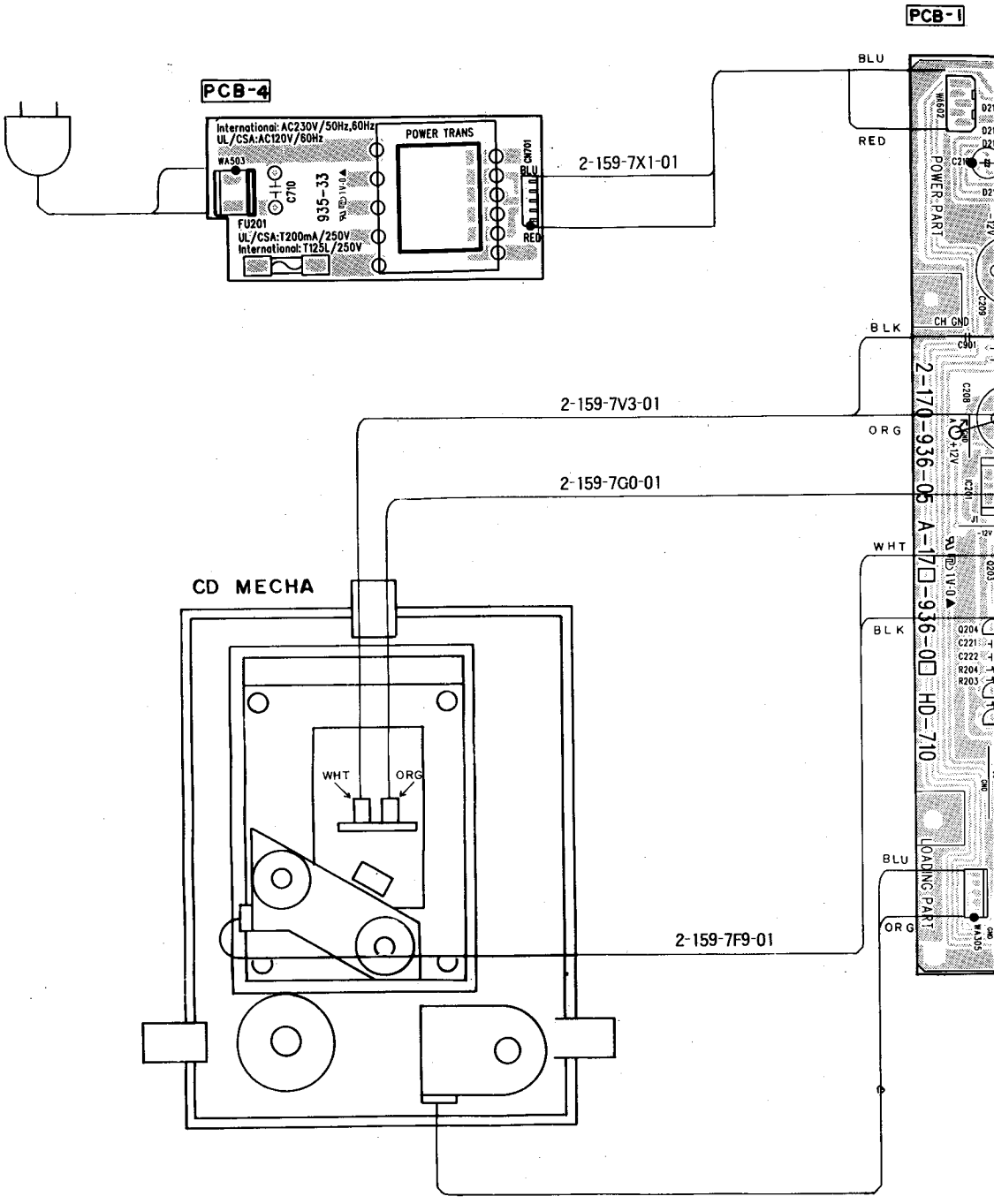
BLOCK DIAGRAM

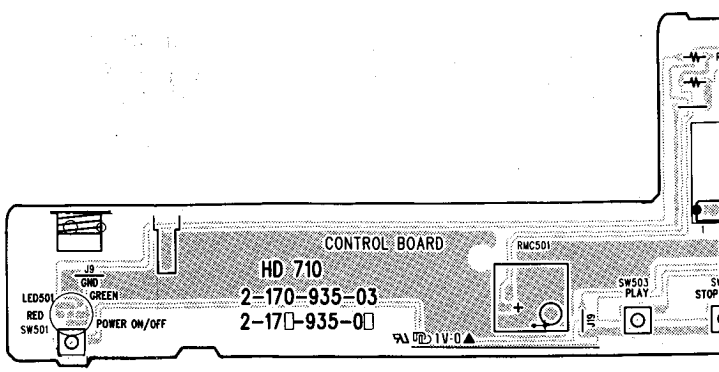



Q101,Q115:2SK246
Q103,Q107,Q113,Q119:2SC1571G
Q105,Q109,Q111,Q117:2SA929G
L-Ch.
LPF
DE-EMP
3rd-ORDER ACTIVE LPF
HEADPHONE PCB
MUTE SWITCH
Q121,Q123:D1303
AUDIO OUTPUT
LRCLK
BCLK
SRDATA
IC101
MN6474AM
D/A C
384FS
OUT(-)
OUT(+)
OUT(+)
OUT(-)
X1
X2
Q102,Q116:2KS246
Q104,Q108,Q114,Q120:2SC1571G
Q106,Q110,Q112,Q118:2SA929G
R-Ch.
LPF
DE-EMP
3rd-ORDER ACTIVE LPF
HEADPHONE PCB
MUTE SWITCH
Q122,Q124:D1303
RMC IN
IC102
PC817
RMC IN
RMC OUT
RMC OUT
Q130
KRA103M
Q920
KTR1003
DE-EMP SWITCH DRIVE
Q127:KSR2003
IC401
DIGITAL SIGNAL PROCESSOR
KA9282
ADTX
XIN
LRCK
ADATA
BCLK
EMP
DIGITAL OUT
IC502
74HC02
Q901
KTC3198GR
DIGITAL OUT
MAIN PCB
IC201
7805
+12V
Q203:KTB1366Y
Q204:KTC3198GR
Q205,Q206:KTA1266GR
+5V
AC10V
AC10V
Q209 : KTC3198GR
Q206,Q210:KTA1266
Q207 : D1207
-5V
-12V
AC4.2V
POWER PCB
IC602
MC4558C
IC601
MC4558C
HEADPHONE OUT
JAC601
VR601
+12V
-12V
HEADPHONE PCB
MAIN PCB

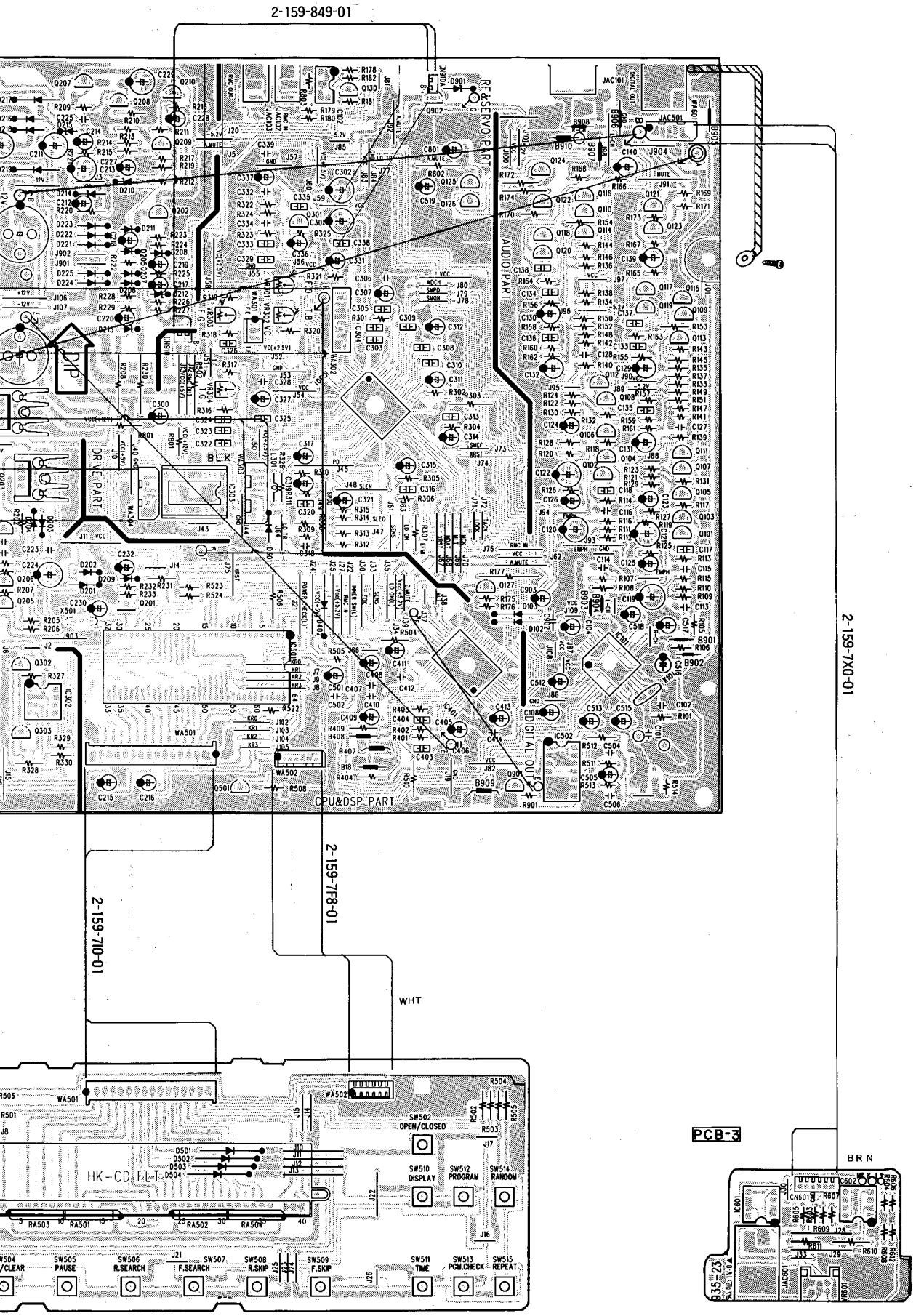
WIRING DIAGRAM




PCB-1
PCB-4
International: AC230V/50Hz,60Hz
UL/CSA:AC120V/60Hz
POWER TRANS
WA503
C710
935-33
FU201
UL/CSA:T200mA/250V
International:T125L/250V
CN701
BLU
RED
2-159-7X1-01
BLK
2-159-7V3-01
ORG
2-159-7G0-01
WHT
BLK
CD MECHA
WHT
ORG
BLU
ORG
2-159-7F9-01
POWER PART
CH GND
LOADING PART
2-170-936-05 A-17□-936-0□ HD-710

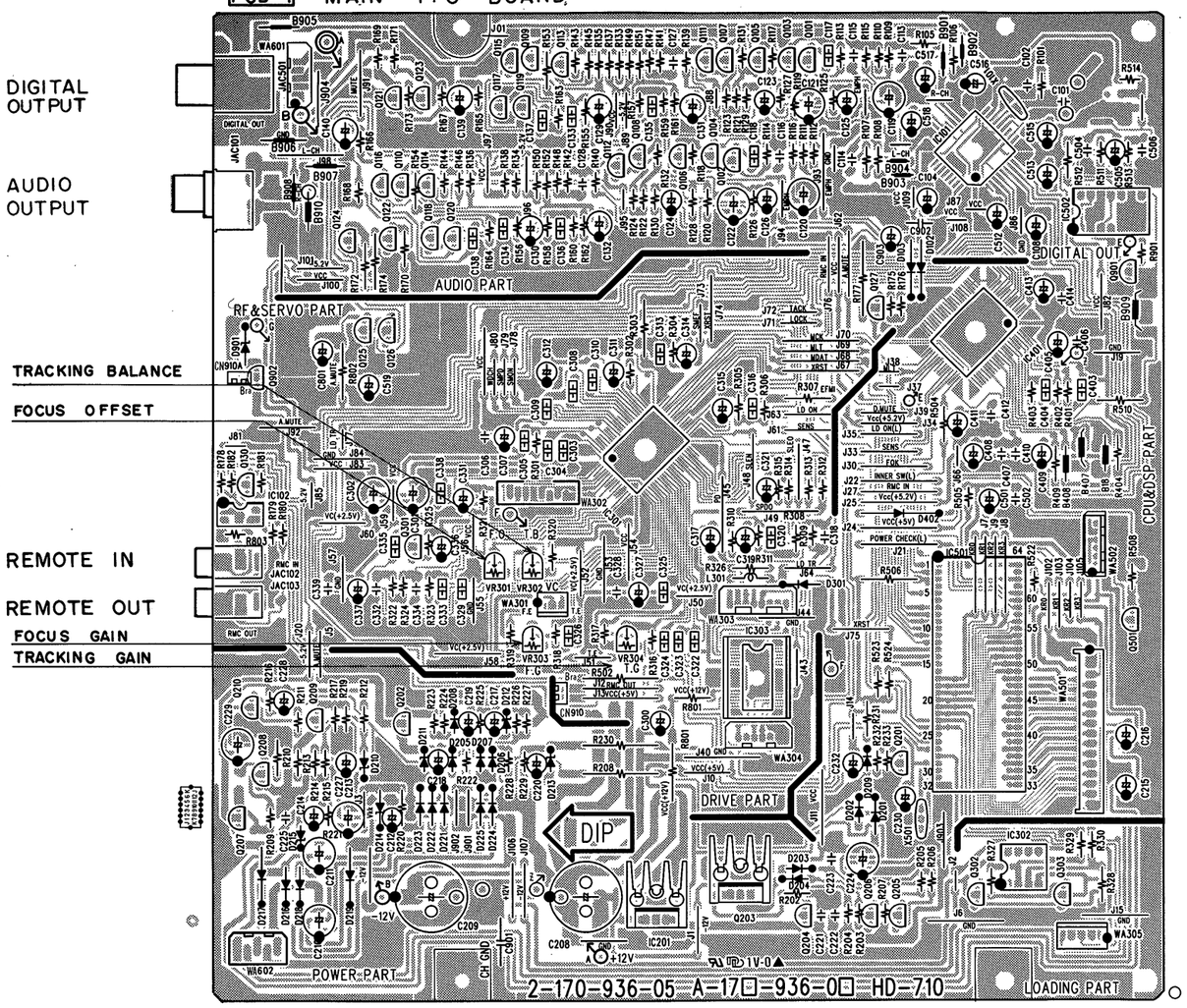

CONTROL BOARD
HD 710
2-170-935-03
2-17□-935-0□
J9
GND
GREEN
LED501
RED
SW501
POWER ON/OFF
RMC501
SW503
PLAY
STOP

WIRING DIAGRAM

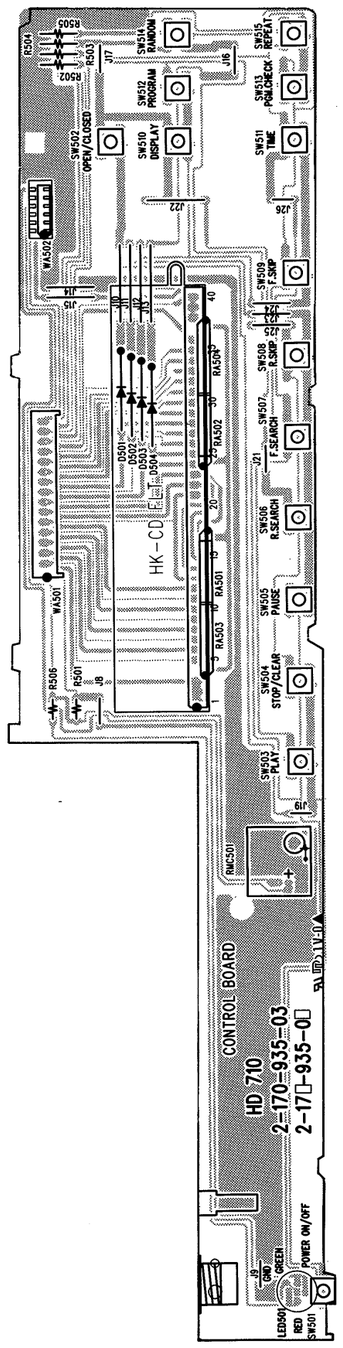


P.C. BOARDS

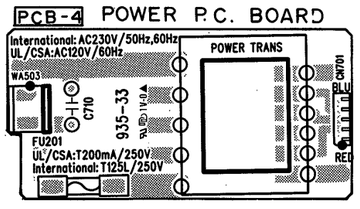
PCB-1 MAIN P.C BOARD



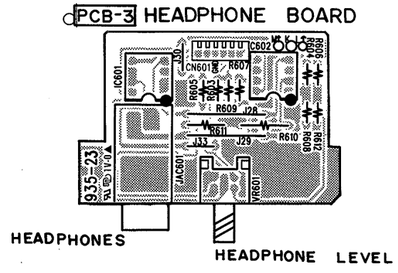
PCB-2 FRONT P.C. BOARD



PCB-4 POWER P.C. BOARD

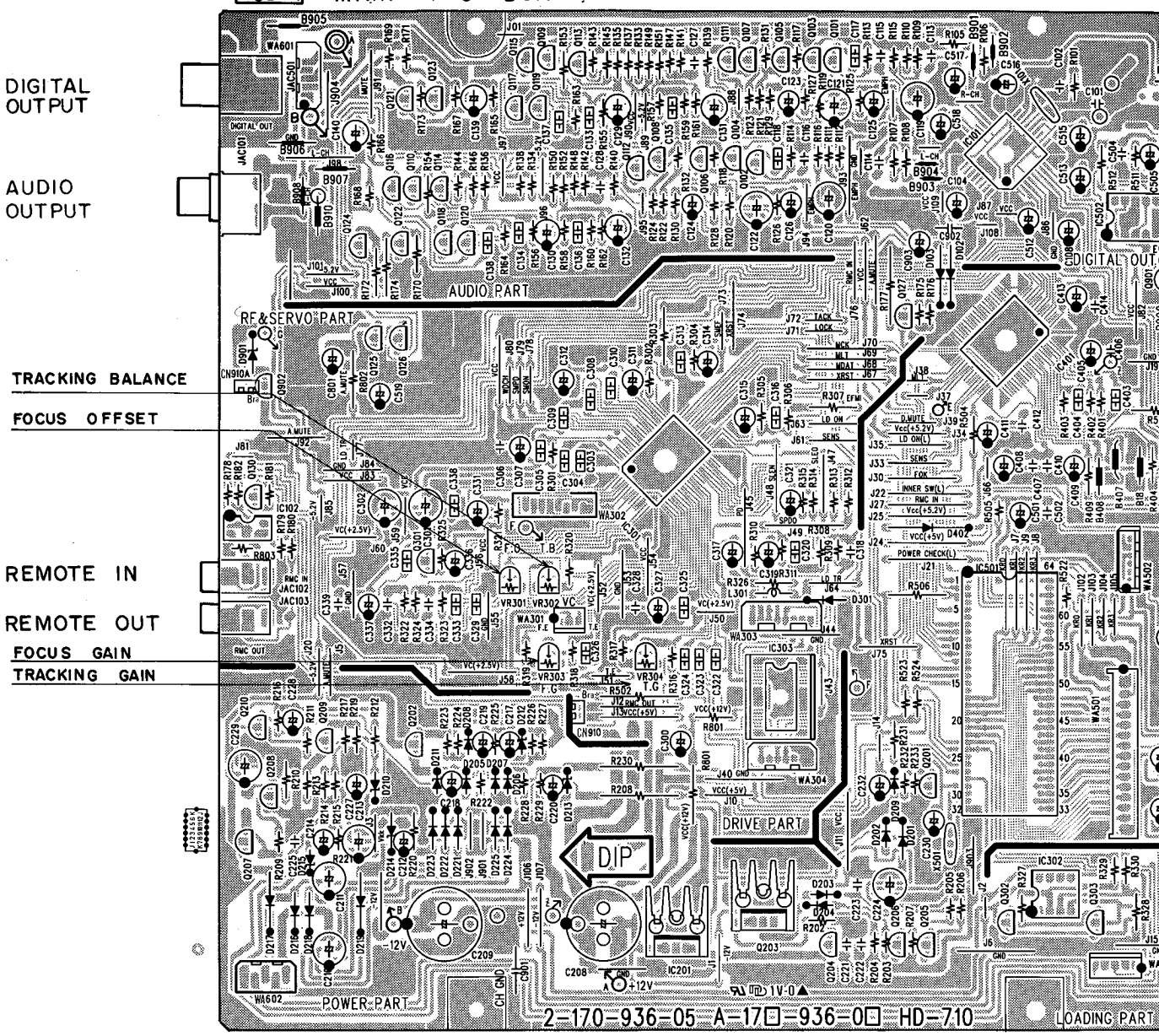


PCB-3 HEADPHONE BOARD

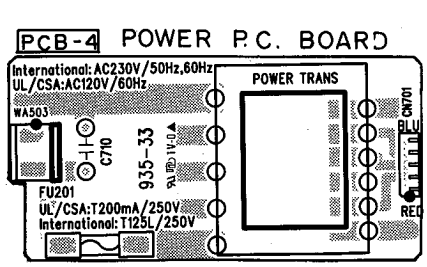


P.C. BOARDS

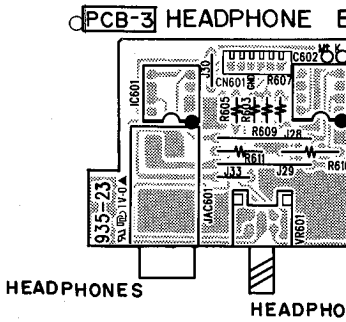
PCB-1 MAIN P.C BOARD

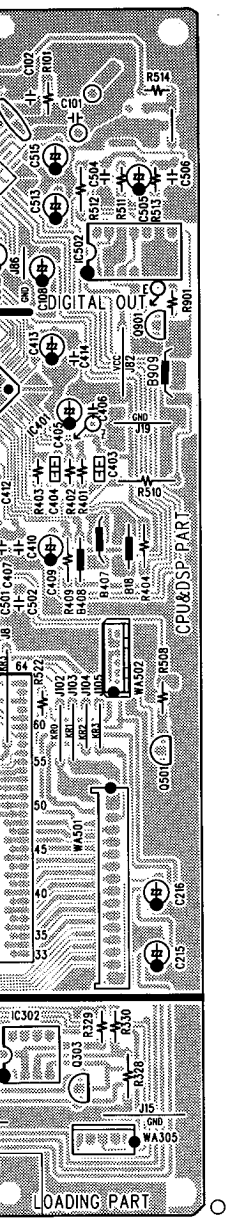


PCB-4 POWER P.C. BOARD

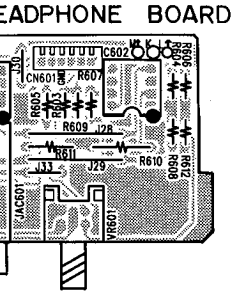


PCB-3 HEADPHONE B



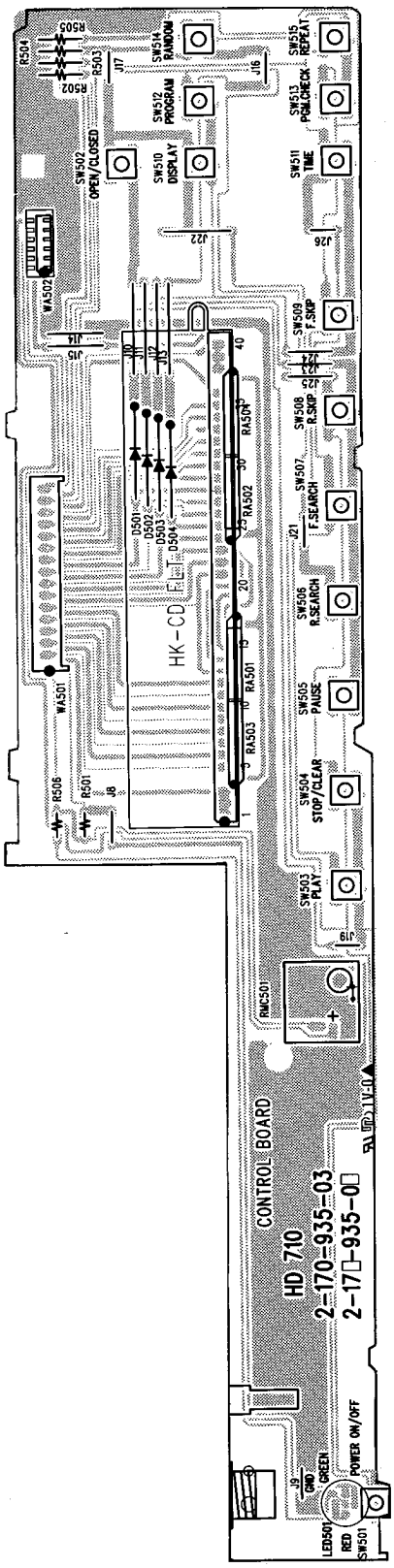


EADPHONE BOARD

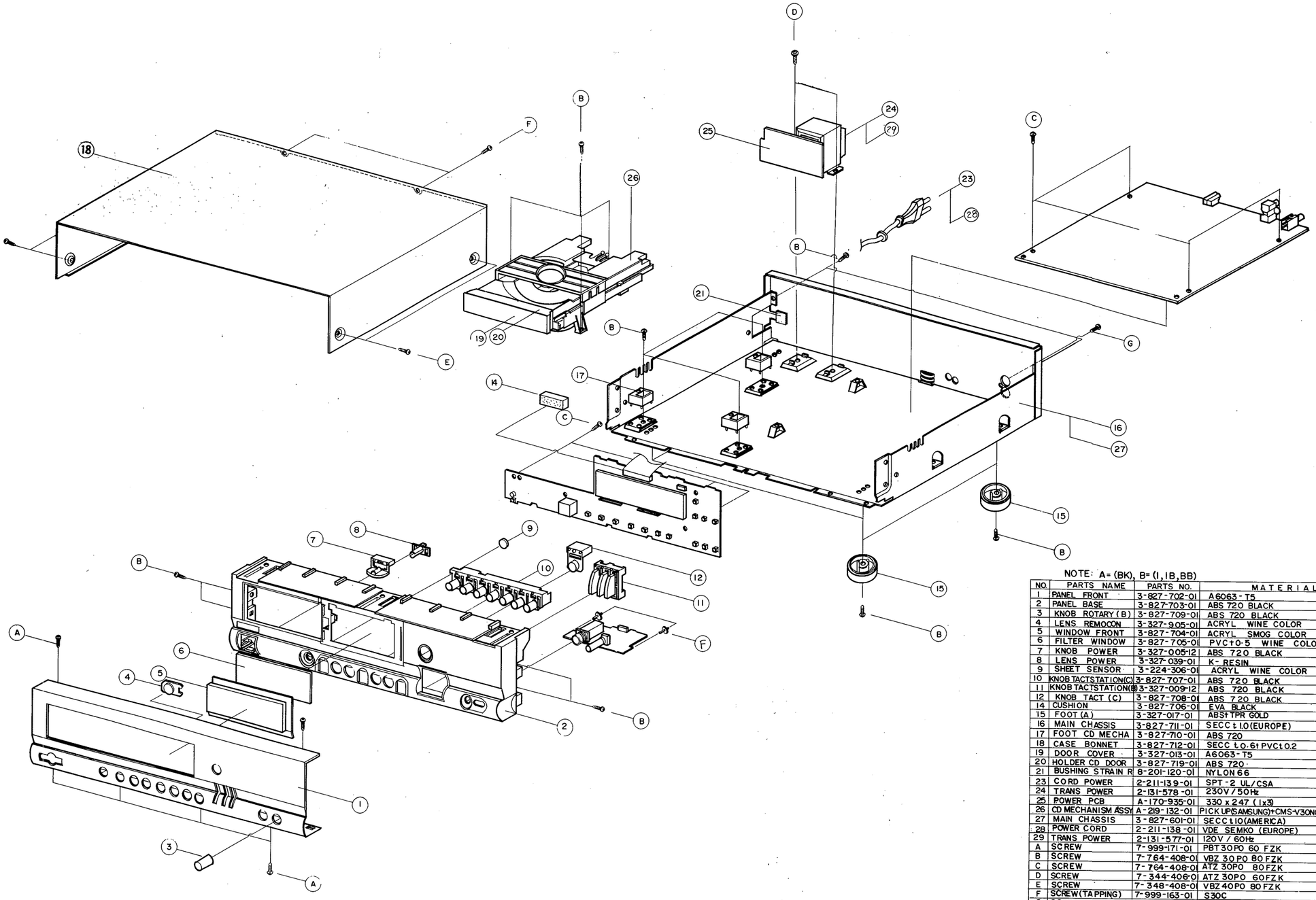


HEADPHONE LEVEL

PCB-2 FRONT P.C. BOARD

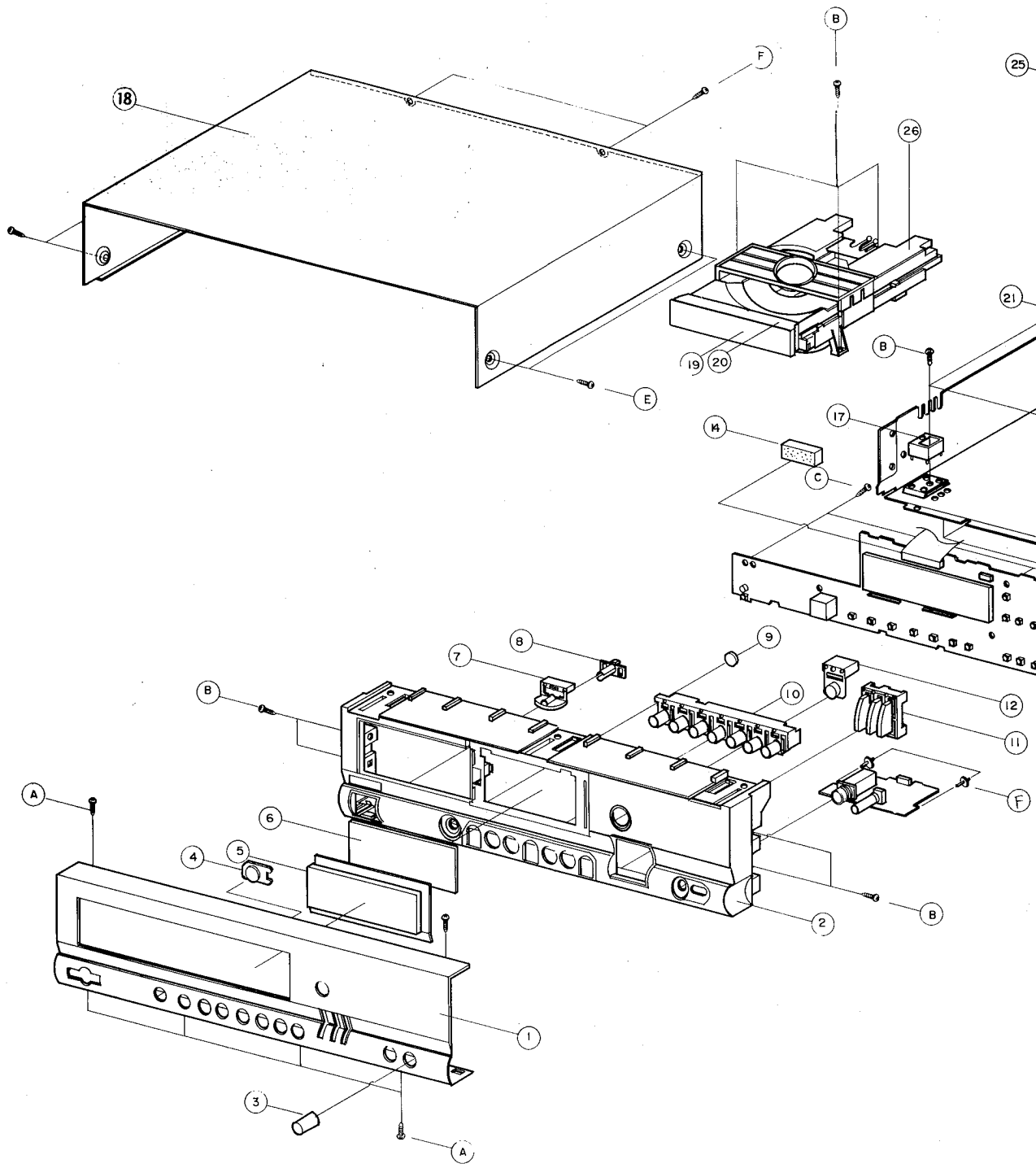


EXPLODED VIEW

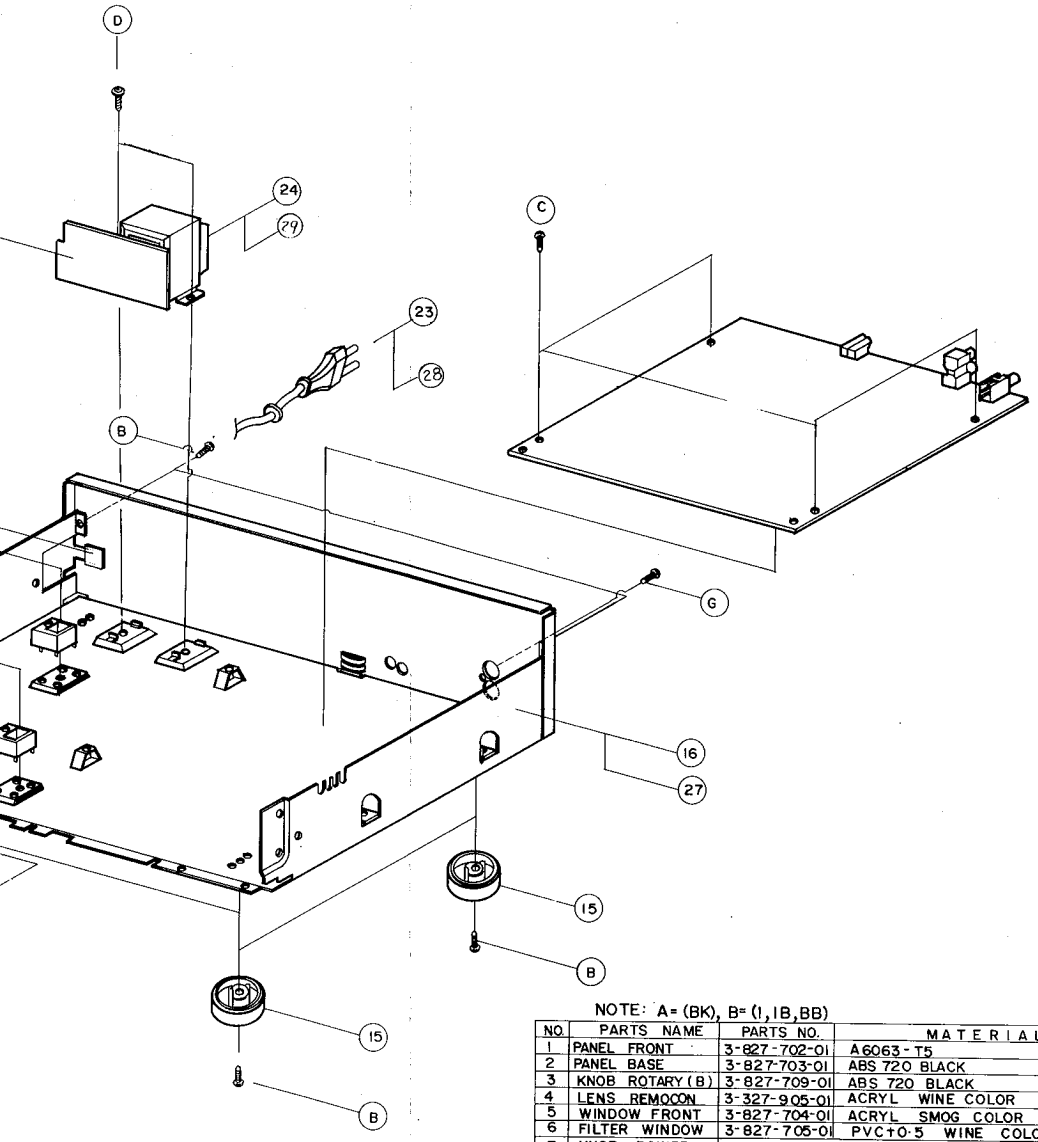


NOTE: A= (BK), B= (1,1B,BB)

NO.	PARTS NAME	PARTS NO.	MATERIAL	REMARK	Q'TY
1	PANEL FRONT	3-827-702-01	A6063-T5	A,B	1
2	PANEL BASE	3-827-703-01	ABS 720 BLACK	A,B	1
3	KNOB ROTARY (B)	3-827-709-01	ABS 720 BLACK	A,B	1
4	LENS REMOCON	3-327-905-01	ACRYL WINE COLOR	A,B	1
5	WINDOW FRONT	3-827-704-01	ACRYL SMOG COLOR	A,B	1
6	FILTER WINDOW	3-827-705-01	PVC t0.5 WINE COLOR	A,B	1
7	KNOB POWER	3-327-005-12	ABS 720 BLACK	A,B	1
8	LENS POWER	3-327-039-01	K-RESIN	A,B	1
9	SHEET SENSOR	3-224-306-01	ACRYL WINE COLOR	A,B	1
10	KNOB TACTSTATION(C)	3-827-707-01	ABS 720 BLACK	A,B	1
11	KNOB TACTSTATION(B)	3-327-009-12	ABS 720 BLACK	A,B	1
12	KNOB TACT (C)	3-827-708-01	ABS 720 BLACK	A,B	1
14	CUSHION	3-827-706-01	EVA BLACK	A,B	1
15	FOOT (A)	3-327-017-01	ABS+TPR GOLD	A,B	4
16	MAIN CHASSIS	3-827-711-01	SECC t1.0(EUROPE)	A	1
17	FOOT CD MECHA	3-827-710-01	ABS 720	A,B	3
18	CASE BONNET	3-827-712-01	SECC t0.6+PVC t0.2	A,B	1
19	DOOR COVER	3-327-013-01	A6063-T5	A,B	1
20	HOLDER CD DOOR	3-827-719-01	ABS 720	A,B	1
21	BUSHING STRAIN R	8-201-120-01	NYLON 66	A,B	1
23	CORD POWER	2-211-139-01	SPT-2 UL/CSA	B	1
24	TRANS POWER	2-131-578-01	230V/50Hz	A	1
25	POWER PCB	A-170-935-01	330 x 247 (1x3)	A,B	1
26	CD MECHANISM ASSY	A-219-132-01	PICK UP(SAMSUNG)+CMS-V30NG6 SUNGRIM	A,B	1
27	MAIN CHASSIS	3-827-601-01	SECC t1.0(AMERICA)	B,	1
28	POWER CORD	2-211-138-01	VDE SEMKO (EUROPE)	A	1
29	TRANS POWER	2-131-577-01	120V / 60Hz	B	1
A	SCREW	7-999-171-01	PBT30P0 60 FZK	A,B	6
B	SCREW	7-764-408-01	VBZ 30P0 80 FZK	A,B	16
C	SCREW	7-764-408-01	ATZ 30P0 80FZK	A,B	8
D	SCREW	7-344-406-01	ATZ 30P0 60FZK	A,B	2
E	SCREW	7-348-408-01	VBZ 40P0 80 FZK	A,B	4
F	SCREW(TAPPING)	7-999-163-01	S30C	A,B	3
G	SCREW	7-764-410-01	VBZ 30P100FZK	A,B	1

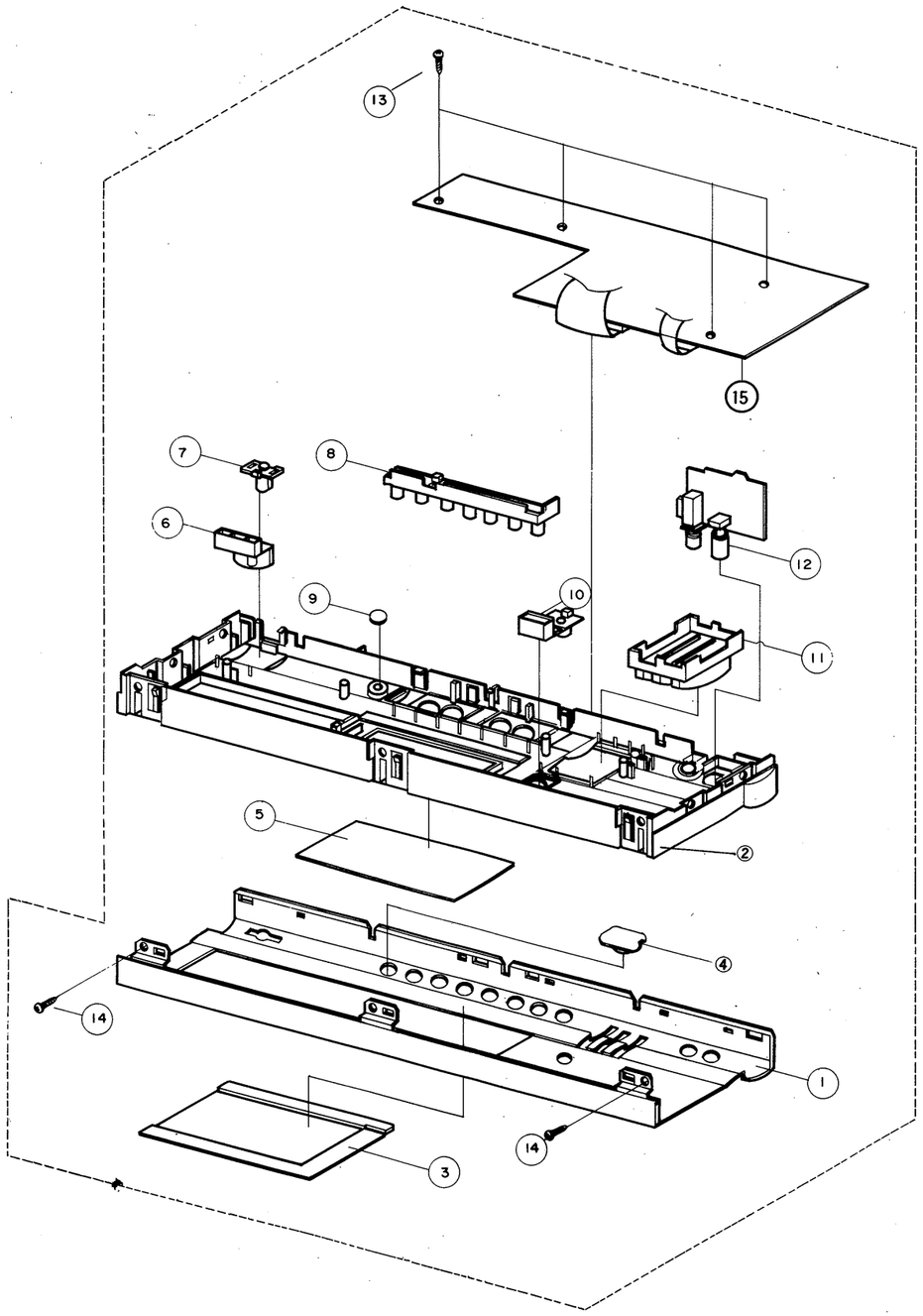

B
F
25
18
26
21
19
20
B
E
17
14
C
9
8
7
B
10
12
11
F
A
6
4
5
B
2
1
3
A

EXPLODED VIEW



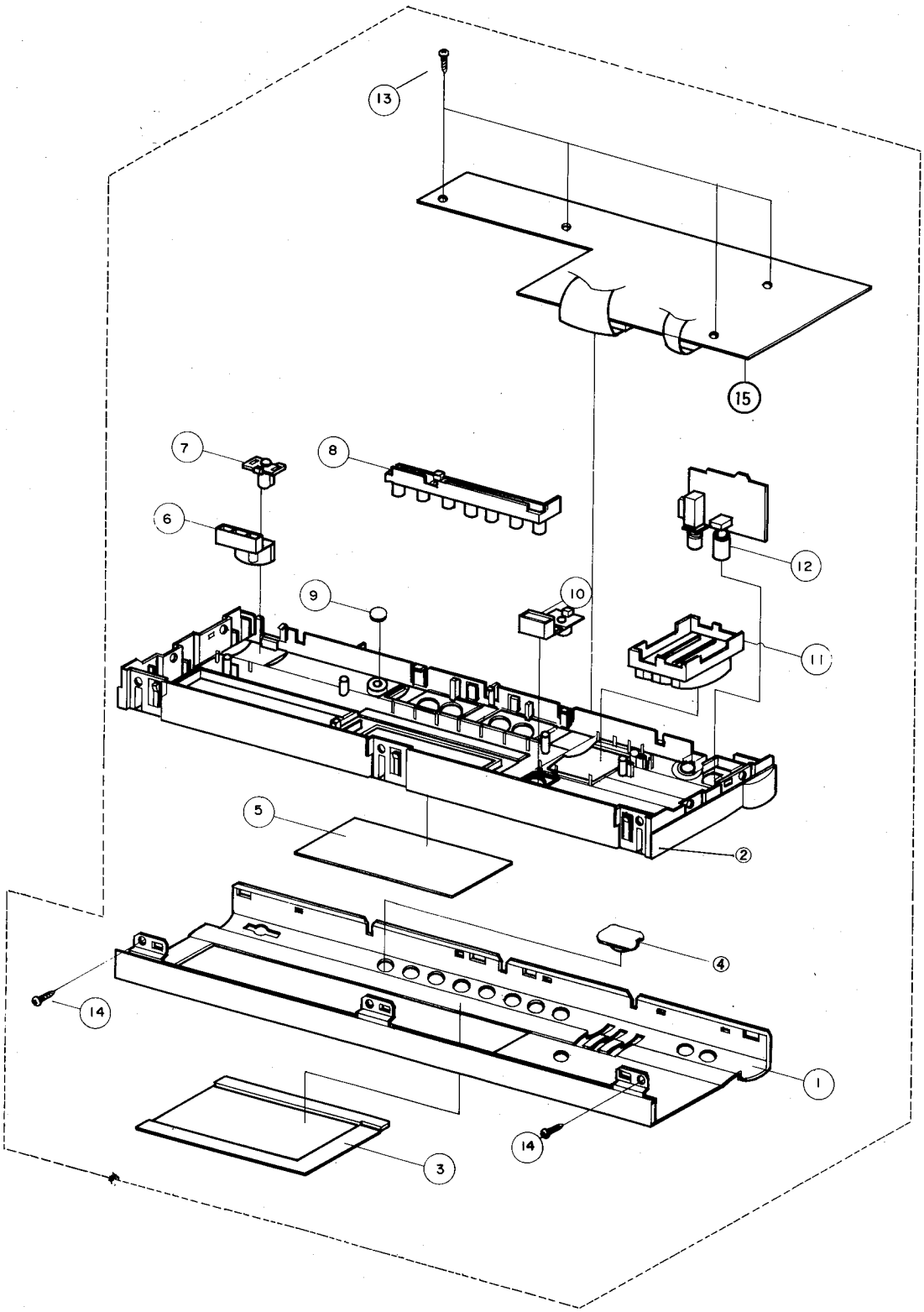
NOTE: A= (BK), B= (I, IB, BB)

NO	PARTS NAME	PARTS NO.	MATERIAL	REMARK	Q'TY
1	PANEL FRONT	3-827-702-01	A6063-T5	A,B	1
2	PANEL BASE	3-827-703-01	ABS 720 BLACK	A,B	1
3	KNOB ROTARY (B)	3-827-709-01	ABS 720 BLACK	A,B	1
4	LENS REMOCON	3-327-905-01	ACRYL WINE COLOR	A,B	1
5	WINDOW FRONT	3-827-704-01	ACRYL SMOG COLOR	A,B	1
6	FILTER WINDOW	3-827-705-01	PVC t0.5 WINE COLOR	A,B	1
7	KNOB POWER	3-327-005-12	ABS 720 BLACK	A,B	1
8	LENS POWER	3-327-039-01	K-RESIN	A,B	1
9	SHEET SENSOR	3-224-306-01	ACRYL WINE COLOR	A,B	1
10	KNOB TACTSTATION(C)	3-827-707-01	ABS 720 BLACK	A,B	1
11	KNOB TACTSTATION(B)	3-327-009-12	ABS 720 BLACK	A,B	1
12	KNOB TACT (C)	3-827-708-01	ABS 720 BLACK	A,B	1
14	CUSHION	3-827-706-01	EVA BLACK	A,B	1
15	FOOT (A)	3-327-017-01	ABS+TPR GOLD	A,B	4
16	MAIN CHASSIS	3-827-711-01	SECC t1.0(EUROPE)	A	1
17	FOOT CD MECHA	3-827-710-01	ABS 720	A,B	3
18	CASE BONNET	3-827-712-01	SECC t0.6+PVC t0.2	A,B	1
19	DOOR COVER	3-327-013-01	A6063-T5	A,B	1
20	HOLDER CD DOOR	3-827-719-01	ABS 720	A,B	1
21	BUSHING STRAIN R	8-201-120-01	NYLON 66	A,B	1
23	CORD POWER	2-211-139-01	SPT-2 UL/CSA	B	1
24	TRANS POWER	2-131-578-01	230V/50Hz	A	1
25	POWER PCB	A-170-935-01	330 x 247 (1x3)	A,B	1
26	CD MECHANISM ASSY	A-219-132-01	PICK UP(SAMSUNG)+CMS-V30NG6 SUNGRIM	A,B	1
27	MAIN CHASSIS	3-827-601-01	SECC t1.0(AMERICA)	B,	1
28	POWER CORD	2-211-138-01	VDE SEMKO (EUROPE)	A	1
29	TRANS POWER	2-131-577-01	120V / 60Hz	B	1
A	SCREW	7-999-171-01	PBT30P0 60 FZK	A,B	6
B	SCREW	7-764-408-01	VBZ 30P0 80FZK	A,B	16
C	SCREW	7-764-408-01	ATZ 30P0 80FZK	A,B	8
D	SCREW	7-344-406-01	ATZ 30P0 60FZK	A,B	2
E	SCREW	7-348-408-01	VBZ40P0 80FZK	A,B	4
F	SCREW(TAPPING)	7-999-163-01	S30C	A,B	3
G	SCREW	7-764-410-01	VBZ 30P100FZK	A,B	1



HD-710/GXAG, KYAG

NO.	PARTS NO.	DESCRIPTION	Q'TY
1	3-827-702-01	PANEL. FRONT	1
2	3-827-703-01	PANEL. BASE	1
3	3-827-704-01	WINDOW FRONT	1
4	3-327-905-01	LENS . REMOCON	1
5	3-827-705-01	FILTER . WINDOW	1
6	3-327-005-12	KNOB POWER	1
7	3-327-039-01	LENS . POWER (B)	1
8	3-827-707-01	KNOB TACT STATION (C)	1
9	3-224-306-01	SHEET SENSOR	1
10	3-827-708-01	KNOB . TACT (C)	1
11	3-327-009-12	KNOB TACT STATION (B)	1
12	3-827-709-01	KNOB . ROTARY (B)	1
13	7-764-408-01	SCREW (ÁTZ 30P080 FZK)	4
14	7-999-171-01	SCREW (PBT 30P060 FZK)	2
15	A-170-935-03	Control PCB	1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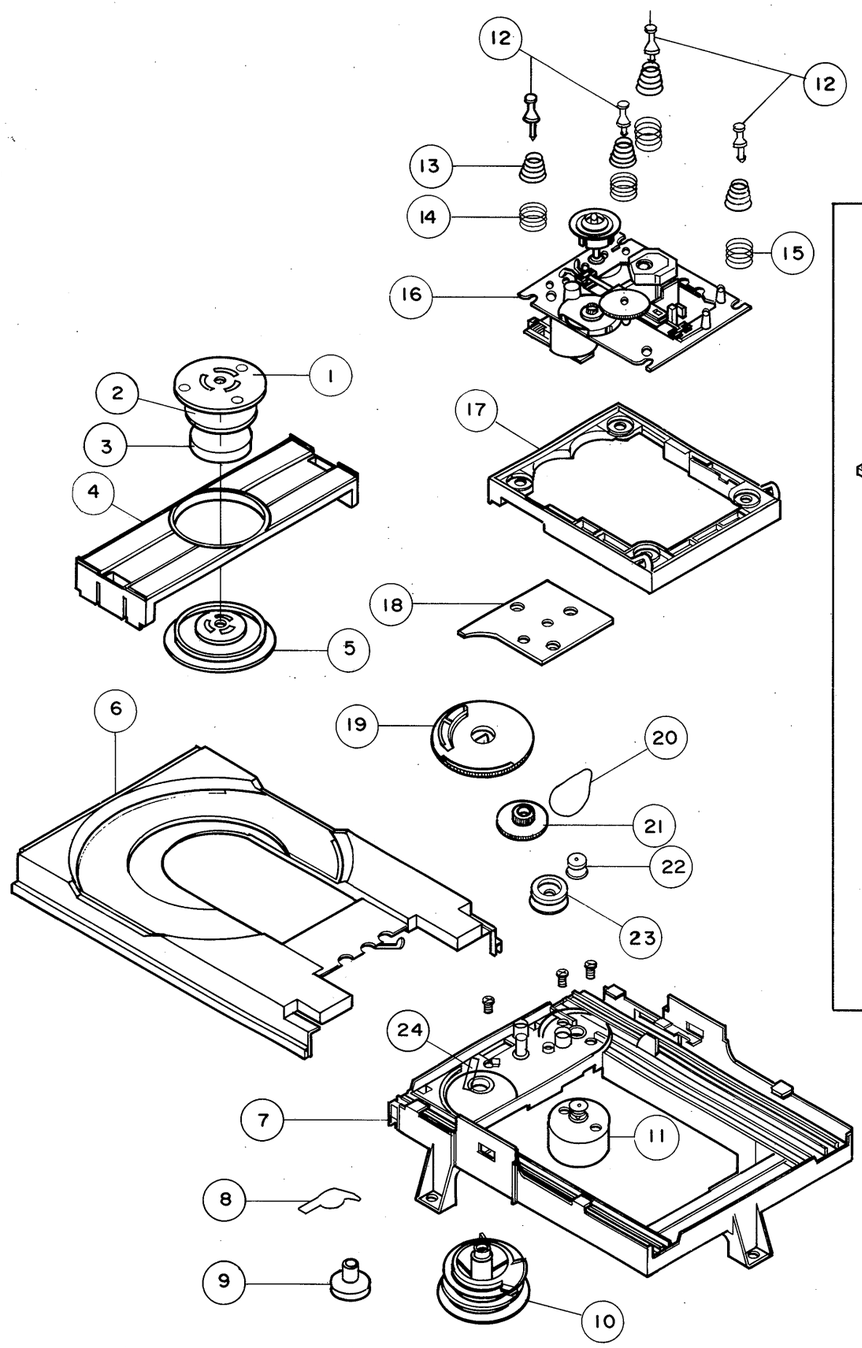
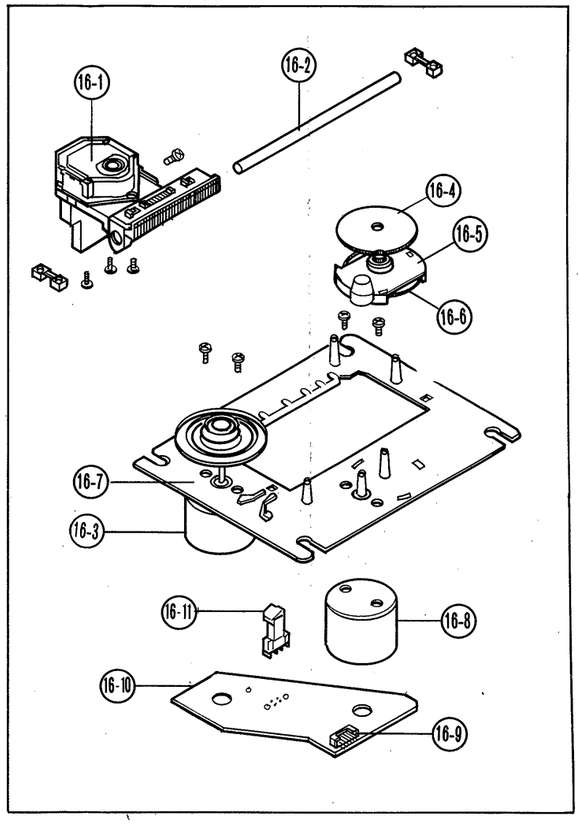
HD-710/GXAG, KYAG

NO.	PARTS NO.	DESCRIPTION	Q'TY
1	3-827-702-01	PANEL. FRONT	1
2	3-827-703-01	PANEL. BASE	1
3	3-827-704-01	WINDOW FRONT	1
4	3-327-905-01	LENS REMOCON	1
5	3-827-705-01	FILTER WINDOW	1
6	3-327-005-12	KNOB POWER	1
7	3-327-039-01	LENS POWER (B)	1
8	3-827-707-01	KNOB TACT STATION (C)	1
9	3-224-306-01	SHEET SENSOR	1
10	3-827-708-01	KNOB TACT (C)	1
11	3-327-009-12	KNOB TACT STATION (B)	1
12	3-827-709-01	KNOB ROTARY (B)	1
13	7-764-408-01	SCREW (ÄTZ 30P080 FZK)	4
14	7-999-171-01	SCREW (PBT 30P060 FZK)	2
15	A-170-935-03	Control PCB	1

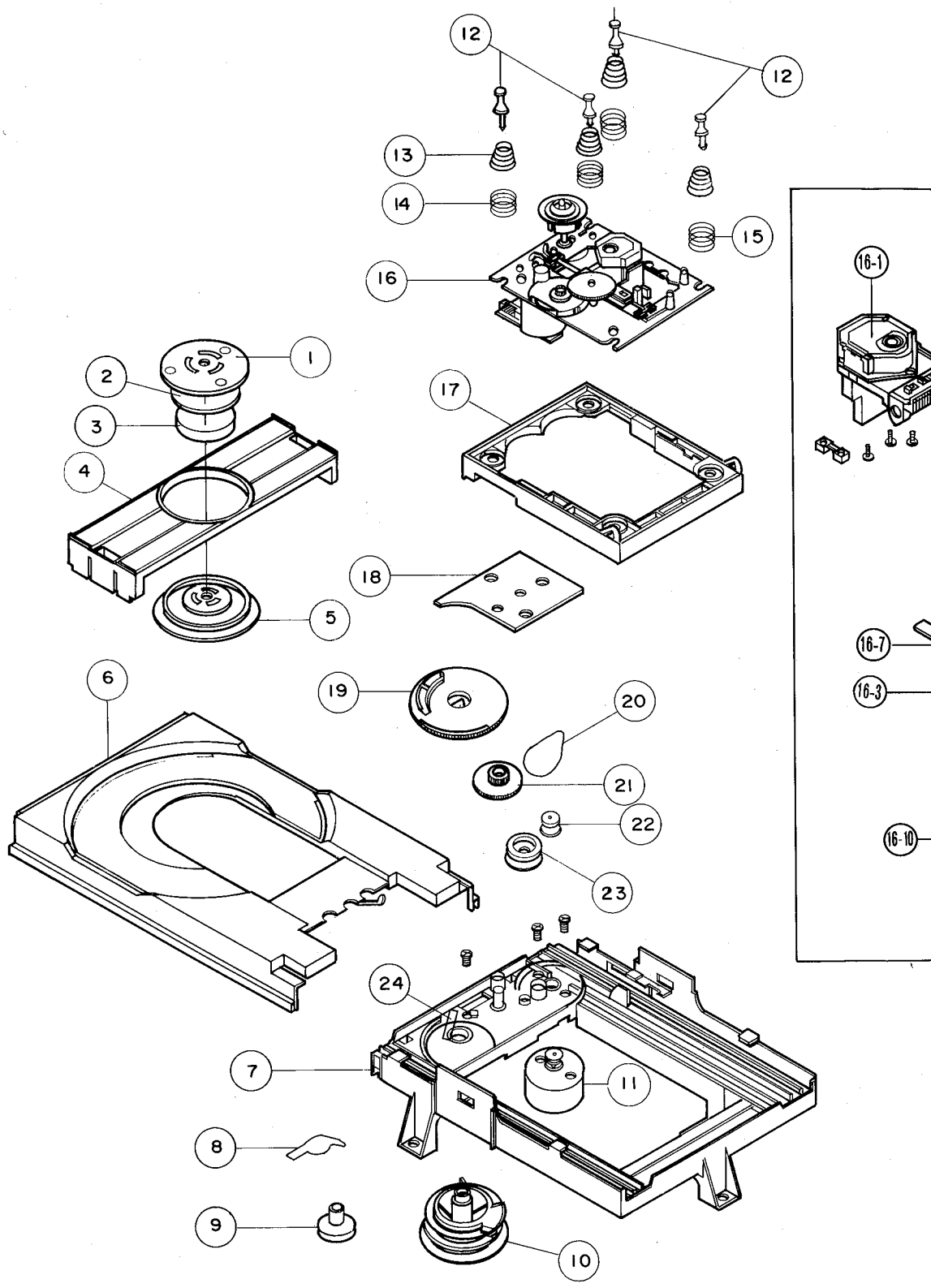
CD MECHANISM EXPLODED VIEW





PARTS LIST

Ref. No.	Part No.	Description	
1	3-818-121-01	PLATE MAGNET	
2	3-818-120-01	CUSHION MAGNET	
3	3-818-123-01	MAGNET	
4	3-818-122-01	HOLDER MAGNET	
5	3-818-119-01	GUIDE MAGNET	
6	3-818-118-01	TRAY CD	
7	3-818-106-01	BASE MECHANISM	
8	3-818-114-01	LOCKER CAM	
9	3-818-115-01	COVER CAM	
10	3-818-107-01	LOADING CAM	
11	2-148-177-01	DC MOTOR	
12	3-615-442-01	RIVET (C)PU	
13	3-615-441-01	CUSHION RUBBER	
14	3-615-445-01	SPRING CUSHION(B)	
15	3-615-446-01	SPRING CUSHION(A)	
16	2-150-527-01	PICK UP ASS'Y	
17	3-818-116-02	BASE SUB	
18	3-818-113-01	COVER GEAR	
19	3-818-111-01	GEAR WADING	
20	3-818-112-01	BELT	
21	3-818-110-01	GEAR IDLE	
22	3-818-108-01	PULLEY MOTOR	
23	3-818-109-01	PULLEY GEAR	
24	2-196-996-01	LEAF S/ W	
16-1		PICK UP	PICK-UP ASS'Y
16-2		SHAFT-PU(MOTOR)	
16-3		MOTOR SPINDLE	
16-4		GEAR(C)	
16-5		COVER GEAR	
16-6		GEAR(B)	
16-7		CHASSIS-DECK(M)	
16-8		MOTOR FEED	
16-9		CONNECTOR. WAFER	
16-10		PCB-SUB	
16-11		LEAF S/ W(pick-up)	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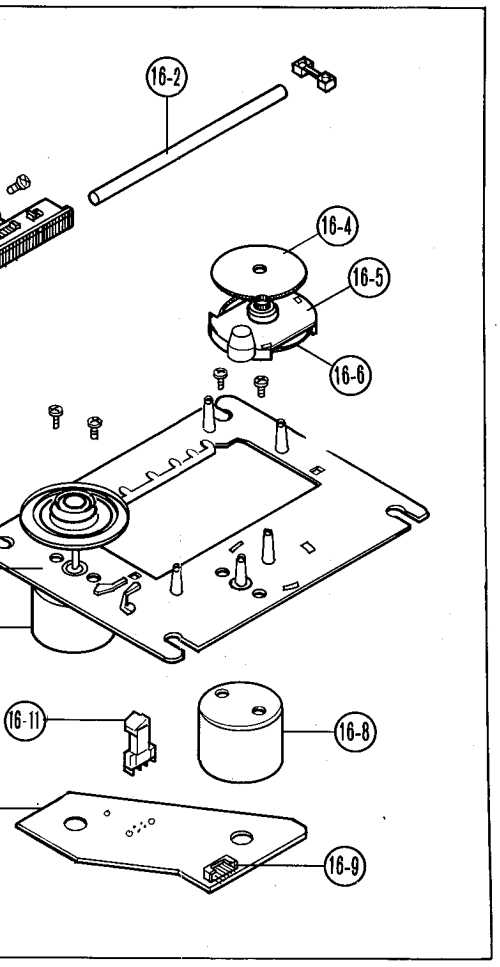
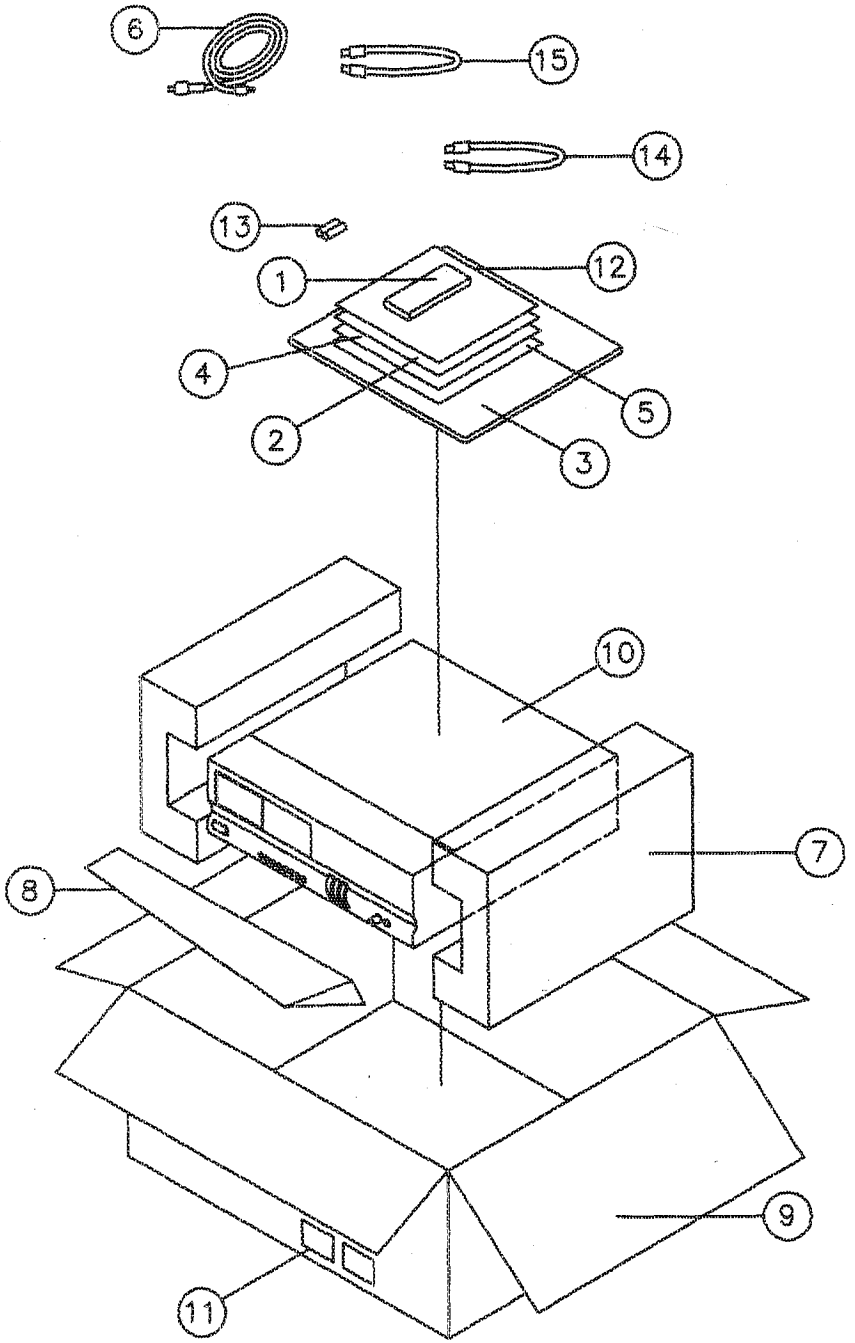
CD MECHANISM EXPLODED VIEW



PARTS LIST

Ref. No.	Part No.	Description	
1	3-818-121-01	PLATE MAGNET	
2	3-818-120-01	CUSHION MAGNET	
3	3-818-123-01	MAGNET	
4	3-818-122-01	HOLDER MAGNET	
5	3-818-119-01	GUIDE MAGNET	
6	3-818-118-01	TRAY CD	
7	3-818-106-01	BASE MECHANISM	
8	3-818-114-01	LOCKER CAM	
9	3-818-115-01	COVER CAM	
10	3-818-107-01	LOADING CAM	
11	2-148-177-01	DC MOTOR	
12	3-615-442-01	RIVET (C)PU	
13	3-615-441-01	CUSHION RUBBER	
14	3-615-445-01	SPRING CUSHION(B)	
15	3-615-446-01	SPRING CUSHION(A)	
16	2-150-527-01	PICK UP ASS'Y	
17	3-818-116-02	BASE SUB	
18	3-818-113-01	COVER GEAR	
19	3-818-111-01	GEAR WADING	
20	3-818-112-01	BELT	
21	3-818-110-01	GEAR IDLE	
22	3-818-108-01	PULLEY MOTOR	
23	3-818-109-01	PULLEY GEAR	
24	2-196-996-01	LEAF S/ W	
16-1		PICK UP	PICK-UP ASS'Y
16-2		SHAFT-PU(MOTOR)	
16-3		MOTOR SPINDLE	
16-4		GEAR(C)	
16-5		COVER GEAR	
16-6		GEAR(B)	
16-7		CHASSIS-DECK(M)	
16-8		MOTOR FEED	
16-9		CONNECTOR. WAFER	
16-10		PCB-SUB	
16-11		LEAF S/ W(pick-up)	



HD−710/GXAG

NO.	PARTS NAME	PARTS NO.	Q'TY
1	REMOTE CONTROL	A−827−7E0−01	1
2	POST CARD	3−327−107−02	1
3	PLOY BAG	3−219−009−01	1
4	WARRANTY CARD	3−327−106−01	1
5	SAFETYGUARD CARD	−	0
6	PLUG WIRE	2−167−103−01	1
7	PAD SIDE(L/R)	3−827−716−01	1
8	POLY COVER	3−327−910−01	1
9	CARTON	3−827−713−01	1
10	POLY SHEET	3−812−725−01	1
11	LABEL BARCODE	3−829−602−01	1
12	OWNER'S MANUAL	3−827−714−01	1
13	BATTERY ASS'Y	2−154−203−01	2
14	COAXIAL CABLE	2−212−131−01	1
15	PIN CORD	2−158−216−01	2

HD−710/KYAG

NO.	PARTS NAME	PARTS NO.	Q'TY
1	REMOTE CONTROL	A−827−7E0−01	1
2	POST CARD	3−327−107−02	1
3	PLOY BAG	3−219−009−01	1
4	WARRANTY CARD	3−327−106−01	1
5	SAFETYGUARD CARD	3−327−108−01	1
6	PLUG WIRE	2−167−103−01	1
7	PAD SIDE(L/R)	3−827−716−01	1
8	POLY COVER	3−327−910−01	1
9	CARTON	3−827−713−01	1
10	POLY SHEET	3−812−725−01	1
11	LABEL BARCODE	3−829−602−01	1
12	OWNER'S MANUAL	3−827−714−01	1
13	BATTERY ASS'Y	2−154−203−01	2
14	COAXIAL CABLE	2−212−131−01	1
15	PIN CORD	2−158−216−01	2